FLIGHT
and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (50 lines).

8-10, CORPORATION ST., COVENTRY. *Telegrams:* Autocar, Coventry. *Telephone:* Coventry 5210.

GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. *Telegrams:* Autopress, Birmingham. *Telephone:* Midland 2971 (5 lines).

260, DEANSGATE, MANCHESTER, 3. *Telegrams:* Iliffe, Manchester. *Telephone:* Blackfriars 4412.

26B, RENFIELD ST., GLASGOW, C.2. *Telegrams:* Iliffe, Glasgow. *Telephone:* Central 4857.

SUBSCRIPTION RATES: Home and Canada: Year, £1 13 0. 6 months, 16s. 6d. 3 months, 8s. 6d.
Other Countries: Year, £1 16 0. 6 months, 18s. 0d. 3 months, 9s. 0d.

No. 1616. Vol. XXXVI. DECEMBER 14, 1939. Thursdays, Price 6d

The Outlook

Tactics and Specifications

TO the ordinary fighting man, and to his kith and kin at home, war is a combination of horrors and heroism. To the student, however, and particularly to an intelligent staff officer, war is a fascinating subject. There is both a science and an art of war. In each campaign the student looks for answers to problems which have puzzled him in time of peace. The questions which the Air Staffs of various countries have put to themselves between 1918 and 1939 were particularly intriguing because the aeroplane is still a very modern invention, and the experiences with the rudimentary machines of the last war provided rather untrustworthy grounds for inferring the course of the next war in the air.

One great question which has been asked many times in the last twenty-one years is whether bombers in formation could force their way through to their objective against the attacks of fighters. Another is whether bombers, flying singly or in formation, should rely on fire power or on speed to be able to carry out their mission in spite of the attentions of fighters. Yet a third question was the nature of the best armament for fighters. The greatest question of all was whether an overwhelming bomber force could win a war by itself, and so relegate all land and sea forces to limbo. According to the ideas which commended themselves to the Air Staffs, so were specifications issued to the manufacturers.

So far this present campaign has only given doubtful answers to most of these problems. It may be inferred that if either High Command had believed that a bomber force could win a war by itself, we should have seen raids in mass by both sides long ere this. The absence of such raids must be taken as some sort of answer to the greatest question of all. The restraint placed upon the bombers leaves the question of massed bombers versus swarms of fighters still unanswered. So far as a small number of incidents goes, we are inclined to conclude that speed without good fire power is not sufficient protection for bomber or reconnaissance machine. No great use has been made of shell-guns in the air, whereas the armament of eight machine guns has given excellent results.

Yet all these conclusions are tentative. New types will presently be produced on both sides, and they will doubtless reflect the ideas which the Air Staffs have formed. New tactics of air warfare may have become crystallised before the war is over—and then we shall all start wondering if they will hold good for the next war.

Aeroplanes and U-boats

THE aircraft of the Coastal Command have lately been having a refreshing amount of luck in surprising U-boats on the surface and dropping bombs on them. In some cases there has been no doubt at all that the pest has been destroyed. In other cases large patches of oil have led the pilot to conclude that the boat had been holed by his bombs. The appearance of oil is not a complete proof that the boat has foundered, for it is a regular trick of submarine captains when attacked to release as much oil as they dare so soon as they have submerged, in order to mislead the attackers and so make their escape.

The value of the work of the Coastal machines should not be measured by the number of U-boats which they can prove to have been destroyed by bombs. The mere sighting of a periscope may have the effect which the Admiralty desire, for once a submarine is known to be

HIS MAJESTY'S STRENUOUS WEEK. During his recent tour of inspection at the front the King visited R.A.F. units. He is here seen inspecting a camouflaged aircraft, of which only the airscrew tip can be seen.

in a certain area, that area receives continual attention. The raider is watched for and harried, and its life is made a misery. As a result it is extremely unlikely that any sinkings will be brought about in that area. Of course, the captain may move the boat to another place, and the search may have to start all over again, but that means that the boat has been driven away from the post which it had chosen as the most desirable for the time being. Some places are much more suitable than others for intercepting merchantmen, and the dangers to our imports and exports are much reduced if the raiders can be driven away from the choice spots. It is certain that when a U-boat sights a British aircraft in the sky it will dive at once, and remain hidden all day, and that in itself is a considerable gain for our cause. To prevent a submarine from attacking ships is the next best thing to sinking it outright.

Why Not?

FROM time to time *Flight* receives letters from inventors asking if there is any very good reason why the heat of the engine exhaust should not be used for preventing ice formation on the wings of aircraft. The Editor has always replied that there seems to be no fundamental reason why this waste heat should not be used, although a good deal of research might be needed before a satisfactory system was evolved.

Now comes, somewhat unexpectedly, confirmation of that view from no less an authority than the American National Advisory Committee for Aeronautics. In their Technical Note No. 723 are given the results of tests by A. M. Rothrock and R. F. Selden. The authors of the report come to the conclusion that of the three possible methods (mechanical removal of the ice, maintaining the surface of the wing at a temperature above the freezing point of water, and providing a surface to which ice will not cling) only the second holds out promise of real improvement, and it is recommended that full-scale tests with exhaust heating should be conducted as soon as possible.

Liquids, the Technical Note states, will probably continue to be satisfactory for airscrews, and might be applied to small surfaces like windscreens. Pastes, while preventing ice from adhering directly, will not, of course, overcome the atmospheric pressure, and needs the addition of some mechanical means.

Earlier investigations have shown that there should be enough heat in the exhaust to prevent ice formation on the leading edge, and if the whole interior of the wing has warm air circulated through it (as it ought to have, anyway, to reduce the fire risk), there will be sufficient warmth to provide a thin water film. The air pressure will then do the rest.

That there will be many problems to solve may be accepted, and the objections are obvious enough, but the problem seems to be one with which we on this side of the Atlantic ought also to occupy ourselves.

SHOWING the WORLD

A Number of British Aircraft Factories Visited by Foreign Journalists: They Know Where They Went, but We are Not Permitted to Give our Readers the Information

Illustrated by "Flight" Photographs

"Somewhere in England." Foreign Press representatives interested in a demonstration of the Vickers-Armstrongs Wellington. On the left, a scene in the wing-covering shops, where female labour is used exclusively.

PRESS representatives of some twenty-two nations, including Russia, were privileged, during a recent three-days tour, to see something of the British aircraft industry so that the truth of our unexampled effort to beat our enemies at air power expansion might be known the world over.

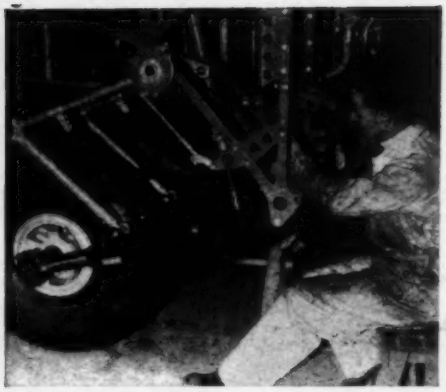
It will be remembered by those who study these things that in 1932 Britain ranked only fifth so far as air power was concerned. This state of things had come about by our desire to achieve international disarmament and financial retrenchment after the last war. However, since some of the nations of Europe were—more or less secretly—piling up arms in general and air power in particular, the original programme of Royal Air Force expansion was undertaken in 1935, to be succeeded by a second and much larger programme in February, 1936. This was deemed necessary on account of further developments in Germany.

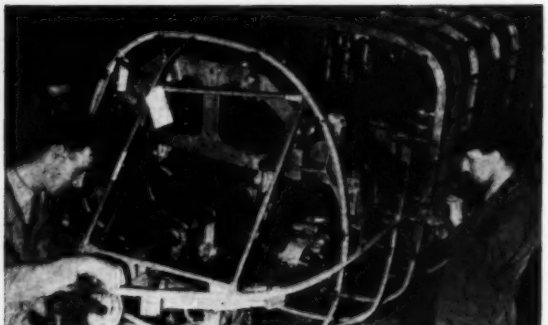
Although this second scheme was due for completion in 1939, the international political situation was still so obscure that in 1938 an even greater degree of acceleration in output was considered necessary, and the fact is that during that year the rate of output of aircraft was more than doubled.

To-day—with the Government's wise decision to prepare for a long war as a means of shortening it—the production of aeroplanes and engines is going full blast. No figures can be given, but it is interesting to note that just prior to the outbreak of hostilities production was at four times the rate of that of the preceding year.

A short account of how this has been done may be of interest. The original 1935 decision found us with an aircraft industry which had been kept alive since the 1914-18 war, more by the foresight of its doyens than by the orders handed out by a parsimonious Government; but it was, nevertheless, extremely virile in the matter of design. The

Yet one more Wellington is taken from the erecting shops to the aerodrome for flight tests.

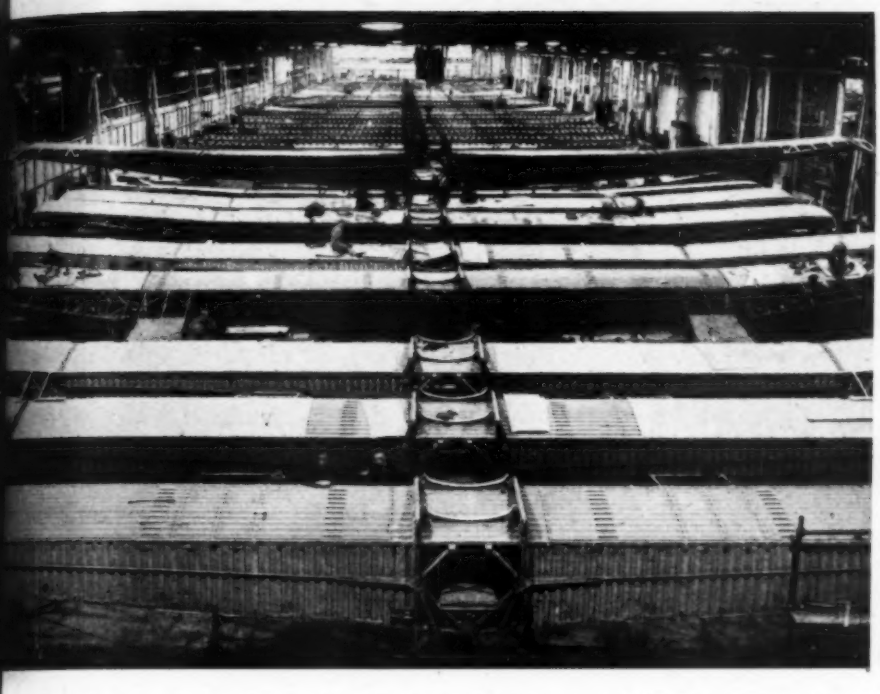




"Somewhere else in England". The pictures on the left show: Top, fitting a Blenheim undercarriage; centre, installing the Bristol Mercury; bottom, building a Blenheim short nose on a jig. Above, a row of Rolls-Royce Merlins being mounted on their engine bearers and fitted with sub-components.

change was very complete. Not only had the firms to expand their productive capacity, but, at the same time, they had to build to the modern all-metal monoplane formula. It is to their everlasting credit that the machines turned out (that is to say, those which are just going out of large-scale production to-day) have all proved to be equal, in many cases superior, to any others the world over.

The 1936 programme made it obvious that outside help would have to be obtained—help, that is, from outside the professional aircraft industry—and so the "shadow"



A 500 yards' stretch of yet another part of England. Armstrong Whitworth Whitley V wings on the jigs.

factories were born. These, it might be explained, are Government factories managed by the large motor car firms. They have done invaluable work in bringing to bear their specialised knowledge of mass production. The energy put into this vast scheme was such that, starting from virgin grassland, production was, in most cases, actually under way in twelve months.

So far so good. The time came, however, when expansion itself had to be expanded, and so the system of sub-contracting on an enormous scale was put in hand. It would, of course, have been possible to have built new factories, but the time element became of paramount importance, and so thousands of engineering firms, large and small, including even the workshops of the main-line railways, have been pressed into service to make "bits and pieces," which are, in their turn, passed on to the main factories for assembly.

For the future it can be assumed that this system will be increased and intensified as newer and even more powerful types of aircraft come into production. At the same time, sight must not be lost of the great schemes for production in the Dominions, which are well out of range of enemy action.

The factories shown to our guests are all producing bomber types, but the construction in each case is so different that interest was maintained through the whole tour.

The first factory visited was that of Vickers-Armstrongs at (deleted), where a Westbrook-Wallis-cum-Geodesy combination is responsible for the Wellington long-range bomber, which has already done signal service in action. As a production job, with its sixty thousand different pieces, the Wellington presented many problems to be overcome, but it has been worth the trouble. To-day there are over four hundred firms sub-contracting for this type alone, and as one goes through the factory three things impress themselves on the visitor: the high degree of jigging and tooling; the large proportion of female labour it is possible to employ; and the stores system whereby exact tally is kept of thousands of pieces which look alike but are of slightly different dimensions.

A two-hundred-mile journey took the party to a "shadow" factory at (deleted), which is managed

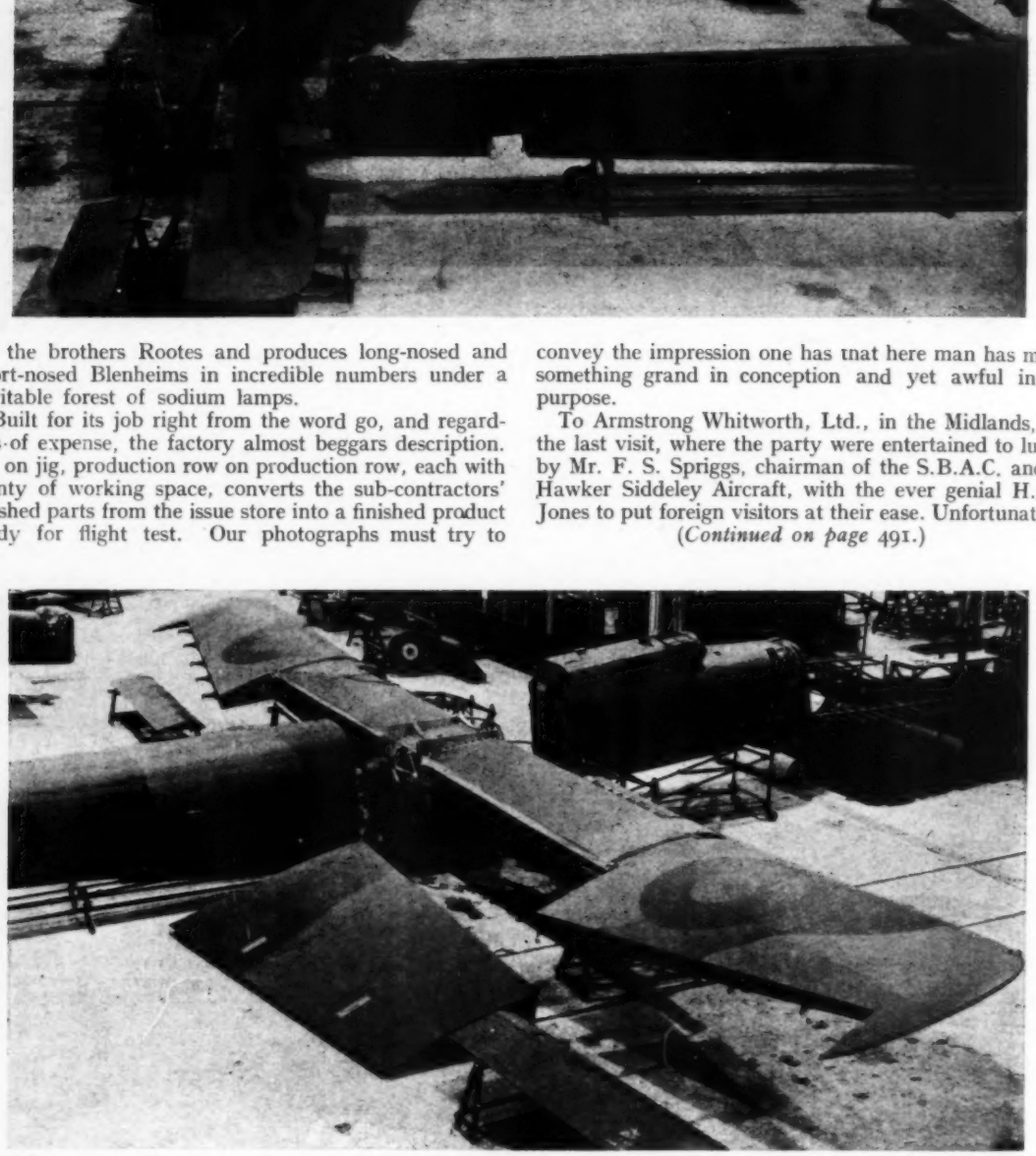
From grassland to production in twelve months. An impressive view of Rootes' Shadow Factory, where long and short-nosed Blenheims are produced at a remarkable rate.

by the brothers Rootes and produces long-nosed and short-nosed Blenheims in incredible numbers under a veritable forest of sodium lamps.

Built for its job right from the word go, and regardless of expense, the factory almost beggars description. Jig on jig, production row on production row, each with plenty of working space, converts the sub-contractors' finished parts from the issue store into a finished product ready for flight test. Our photographs must try to convey the impression one has that here man has made something grand in conception and yet awful in its purpose.

To Armstrong Whitworth, Ltd., in the Midlands, for the last visit, where the party were entertained to lunch by Mr. F. S. Spriggs, chairman of the S.B.A.C. and of Hawker Siddeley Aircraft, with the ever genial H. K. Jones to put foreign visitors at their ease. Unfortunately,

(*Continued on page* 491.)



Erecting Merlin-engined Whitley Vs. The upper picture shows the enormous erecting shop, which is a companion to the wing shop on the previous page. The lower photograph shows sub-assemblies laid out in approximately the position they will occupy on the machine.

BRASS HATS over BONE HEADS

"A. Viator" Ventilates a Legitimate Grievance : The Plight of Civil Aviation

A LEADING article in *The Times* recently criticised the censorship fairly severely. It commenced by saying that the Minister's replies to questions did nothing to extricate the department from the ambiguous and unsatisfactory twilight which has been confusing and impairing its activities.

We know that departmental twilight sleep, tending at times to a complete black-out, and it is not only the censorship which suffers from it.

But the point of the article, like that of the hornet, was towards the latter end of it, where the writer said: "Confidence can be restored only when the responsibilities of the censorship have been placed expressly in *civilian hands.*"

Any business matter, whether it is to do with vital propaganda abroad, the dissemination of news at home, or the operation of civil air services essential to the community must be in civilian hands.

Military mentality is mainly destructive, as is right and proper in its own sphere, and it can never comprehend the necessities of any constructive business.

Secret Sh . . . ham

Reverting for a moment to censorship you will find that name Shoreham Airport is still being deleted by some silly little censor from some, but not all, newspaper articles.

But "Radio Hombog" perpetually refers in loud but broken accents to Zhore-am, and there is hardly a man, woman or child in neutral or belligerent countries who does not know all about it.

When this war started Brass Hats which were superimposed upon Bone Heads said: "Let there be no civil aviation," and lo! it was not so.

Neutral companies, particularly K.L.M., pointed to the undeniable rights of neutral shipping, whether on the high seas or in the high airs, to go about its lawful occasions, and it is a fact that but for an embargo lasting for a number of weeks, neutral air traffic would never have ceased.

Because the Brass Hats had decided to suspend British civil aviation almost altogether, they had the impertinence to regard it as an impertinence when neutrals refused to stop flying.

As boat travel was almost as a standstill, their efforts practically turned England into an island, in the worst sense of the word, for a time.

They could see no importance in neutral air services, but only the nuisance they might create from a military point of view.

Naturally, I suppose, they could not be expected to see, for example, that British newspapers reaching Holland, Belgium and Scandinavia the same day was of vital importance to this country—until a noble lord enlightened them in the House of Lords upon the matter. They were not aware either of the difference it made to very big business interests when air mails were carried to and from neutral countries, nor could they realise that a scrubby little passenger in a black coat might be more important than all the brass-panoplied, spur-clanking whatnots of Whitehall.

Big trade follows the trader, and the scrubby passenger often has a million pounds' worth of business in his hands, and when business is really big, swift travel for the kingpin business man is vital. Only when the big man himself is on the spot can big business deals be effected.

What probably impressed the Brass Hats most, however, was that neutral Royalty and Ambassadors were travelling by air—so they graciously allowed air travel to continue, but without proper facilities.

I say without proper facilities because at the time of writing the only airport from which neutral air lines may operate is under water and has been declared unserviceable by the Airport Authorities.

Air transport between this country and several important neutral countries has therefore temporarily terminated and there is no saying whether it will operate again for days, weeks or months. It depends entirely on the rainfall and *on the fact that the Brass Hats have refused to allow civil aviation to operate from any other airport in England.*

Although the proper authorities were warned some time ago that Shoreham might be put out of action, nothing was done about it, although I am convinced that there is no adequate military or other reason why another airport should not be used temporarily in order to maintain vital air communications.

In Berlin

Comparisons may be odious, but the fact remains that the Nazi Thugmeisters have been intelligent enough to keep Tempelhof (in the heart of Berlin, almost) open for neutral air traffic, and that is one of the best-equipped airports in Europe.

Almost all navigational assistance is denied to neutral air liners approaching England in excessively difficult winter flying conditions, whereas Berlin offers neutrals both wireless facilities and the use of the radio beacon.

It is not the Directorate of Civil Aviation which is to blame, for that department has done everything in its power to assist and promote civil flying, both British and neutral. A very high civil official said to me recently, "The bone-headed Brass Hat is in the saddle to-day and has the reins in his hands, and what's more he has the bit between his teeth."

Fine mixed metaphor, that, but it's true, nevertheless. Let me finish by re-quoting *The Times* article:—

"Confidence can only be restored when the responsibilities of the censorship have been placed expressly in civilian hands."

For censorship please read commercial aviation.

Exit Sh . . . ham

Shoreham Airport, to the joy of the local seagulls who use it as a swimming pool, has been officially pronounced to be unserviceable. As a matter of fact, the surface has stood up to the heavy traffic remarkably well, and the under surface is still hard. Incessant rains, quite unusual in this neighbourhood according to local shepherds and fishermen, from whom, by the way, we get our most detailed and reliable weather reports these days, have turned it into a bog, and it is essential, anyway, that the place should have a rest.

A Sabena machine,, a D.C.3, got well and truly bogged in a particularly creamy patch and sank steadily for a couple of days until the wheels were practically underground. Enough timber to build a small but convenient seaside bungalow was put under the wheels and is now fathoms deep. Possibly in ten thousand years' time this will start a bog oak industry, but it helps the present situation very little.

Every sort of mechanical device and all manner of mechanical transport tried in vain to extricate the plane.

Then it was that a mediæval pageant, all the King's horses and all the King's men, approached across the aerodrome through the perpetual drizzle.

Eight enormous quadrupeds with feet like dustbin lids, promptly christened Hawtin's Light Horse, plopped towards the despairing D.C.3 and promptly yanked it from its watery grave. Vaguely, through the mist, we who watched from the windows saw something like a pear-shaped coach and four (plus four) trundle away. As a

watching Danish pilot remarked, "My kingdom for a Norse."

A passenger booked for an early date by K.L.M. to Holland is the tiny dusky piccaninny saved from the Dutch vessel *Simon Bolivar*, for whom, it seems, no parents or relatives have yet been found. It is perhaps a pity that, owing to the exigencies of the situation, the K.L.M. has found it wiser on the whole to employ stewards rather than Air Hostesses on the London line, for the baby is travelling unaccompanied and the steward will have to "hold the baby" on this occasion.

How proud the officers and gent—beg pardon, of the Nazi Navy must be of the long list of women and children to their credit—or is it debit? Maybe visitors to the barnacle-encrusted battleships in harbour are shown with pride plaques on the wardroom wall recording these treacherous sinkings—or Nazi battle honours. But, possibly for lack of reasonable facilities for air transport in this country, the piccanniny will be unable to travel.

I see in the newspapers the photograph of an old K.L.M. pilot, Swedish Count Karl von Rosen, who has volunteered to fight on the clean side in Finland. A fine fellow and a sportsman, he is always to be found fighting on the side of the oppressed. He took a couple of old single-motor Fokker transport planes bought from K.L.M. to Abyssinia for ambulance work, and needless to say he fought on the side of Ethiopia. Let us hope he gets a good bag of aromatic Moujiks this time.

There is news of a hand-propelled lifeboat in which everyone can help to drive a propeller by means of levers. It is pointed out that everyone can thus help and keep warm.

Uncle Hermann, Chief of the *Luftwoffle*, is said to favour the idea for his bombers, especially now that petrol has to be manufactured by squeezing apple pips and mashing turnips. His view is that it will keep the crews warm on their way to England, after which they need not worry, as a warm reception awaits them! A. VIATOR.

Electrical Equipment in Newfoundland Airport

AT the big Newfoundland Airport, covering in all nearly 1,000 acres, which has been constructed for the intended transatlantic services, no power from outside sources was available and the whole plant had to be made self-contained. The permanent equipment consists of four main diesel-electric alternators, each rated at 80 kva, and two standby units of 20 kva and 10 kva respectively. The supply is at 230 volts, 50 cycles, and is used to feed all the aerodrome electrical services. This includes the radio equipment, the white beacon of 11 million candle-power, the red of 3½, and the 16 foot high neon beacon. The 22 foot wind tee and the boundary lighting (with its two independent alternate circuits) and the runway contact lights (some of which are of the sodium type) also absorb some of the power. And lighting, telephone, refrigeration, radio and heating requirements must be met.

In providing power for a marker-beacon on the opposite shore of Gander Lake, which is 30 miles long and 2 miles wide on the south-western boundary of the aerodrome, a line of cable had to be laid across the lake. This was found to be 96oft. deep. The high voltage and the tremendous water pressure called for a very high standard of construction in the cable and splicing was not allowed; the whole 12,000ft. required was made in one length.

The Civil Air Reserve in Australia

APPLICATIONS for enrolment in the newly formed Civil Air Reserve in Australia have been so great as to temporarily overwhelm the training facilities available. To receive approval to train reservists, clubs and schools must undertake to maintain at least four aircraft, with at least three in service at any time. One must be equipped for blind-flying, and ultra-light aircraft are not accepted. Trainees are required to sign an undertaking to join the R.A.A.F. when called upon.

It seems that they must pay at the rate of £1 10s. an hour for dual and 10s. an hour solo. Ten hours dual and 15 hours solo during the first year will cost the reservists about 10s. per week, a sum which is not a small one to a young man who is probably not in a highly paid job, may be helping to maintain dependants, or saving to get married. We wonder that there were so many applicants and we join with the Australian *Aircraft* in pointing out that the very least that should be done for the reservists is to refund the money to them in the no doubt, almost certain event of them being called up.

Airline Purchases in U.S.A.

IT is reported than Transcontinental and Western Air have ordered five of the big Boeing 307 "Stratoliners," for delivery early next year. And Pan American Airways have also ordered three for services across the North Atlantic and to South America. The same company is also going in for Boeing 314 "Clippers" in a big way; six more are ordered, which, with the six delivered this year, brings their fleet up to twelve. The option exercised by the company provides for the delivery of the first early in 1941. This foreshadows increases in the transatlantic, China and New Zealand services.

Mid-Continent Airlines of Kansas City have ordered three of the new Lockheed "Lodestar" aircraft, so becoming the first purchaser. Delivery is next March. Douglas, of course, is still very much in the picture with orders for ten DC3s from Pennsylvania-Central, thirteen from Pan American, while United Air Lines want seven more Mainliners by next April. This totals up to 47 new transports. Thirty-nine of them, worth 13,000,000 dollars, were ordered in one month.

Women Ferry Pilots

UNDER a scheme now launched by the Air Ministry, women pilots will be employed to "ferry" new R.A.F. aircraft of light training types from the factory where they are made to an aerodrome for storage, until they are required for service purposes.

At the outset, it is contemplated that only eight women pilots will be employed. They will form a section of the Air Transport Auxiliary Service under British Airways, Ltd. Miss Pauline Gower, daughter of Sir Robert Gower, M.P., has been appointed to take administrative charge of the section. A selection board, of which Miss Gower is a member, is now proceeding with the testing and selection of applicants for employment in this section.

For the present, it is intended that the women pilots will "ferry" one type of aircraft only. There is, however, a possibility that the scheme will be extended at a later stage, and that other types will be similarly "ferried" from different factories as the occasion arises.

Salary will be paid to the women, plus flying pay. It is hoped that the scheme will release men pilots for other duties.

Christmas Cards and Calendars

READERS will recall the reference in our issue of November 30 to the production by Raphael Tuck and Sons, Ltd., of Christmas cards and calendars of our artist, Mr. F. Gordon-Crosby's coloured picture, "In a World of Space," the entire publisher's profits on which are to go to the R.A.F. Comforts Fund. Orders for these cards can be addressed direct to *Flight*, and the prices are as follows:

Folder cards	3d. each
Ribbon leaflet cards	6d. each
Calendars (11 in.×8½ in. app.):	
Plain finish	1s. 6d. each
Oil facsim. finish	2s. 6d. each

Postage will be free on all orders of 3s. and above. Both cards and calendars are obtainable also from high-class stationers.

ENEMY AIRCRAFT

A MUCH APPRECIATED *FLIGHT* FEATURE

GREAT value has been placed upon the exclusive series of drawings and data published in recent issues of *Flight* of German military machines.

This series commenced in the issue of September 21 and has been in great demand in military and civil centres. For the guidance of those who have not studied the whole series we quote below the dates and subjects:—

1.	THOSE HEINKEL BOMBERS	- Sept. 21
2.	GERMANY'S DIVE-BOMBERS	- Sept. 28
3.	FIGHTERS OF THE *LUFTWAFFE*	- Oct. 5
4.	THE JUNKERS BOMBERS	- Oct. 12
5.	SOME GERMAN SEAPLANES	- Oct. 19
6.	"A.C." TYPES OF THE *LUFTWAFFE*	- Oct. 26
7.	THE DORNIER BOMBERS	- Nov. 2
8.	THE DORNIER FLYING BOATS	- Nov. 9
9.	GERMANY'S AERO ENGINES	- Nov. 16

WAR — AND THE DEVELOPMENT OF THE AERO-ENGINE

A Famous Engineer Discusses Design with Special Regard to Sleeve-valve Air-cooled Radials

By
A. H. R. FEDDEN, M.B.E., D.Sc. M.I.A.E., M.I.Mech.E., M.S.A.E., F.R.Ae.S.

The writer of this article, Mr. A. H. R. Fedden is one of the most distinguished of British designers. He is the chief engineer, Aero Engine Department, of the Bristol Aeroplane Co., Ltd., and is President of the Royal Aeronautical Society. In 1938 he was awarded the Daniel Guggenheim Gold Medal

FOR the second time in its history, the British aeronautical industry is making an important contribution to the safety of the Empire and her Allies. The present conditions are, however, radically different from nearly every aspect.

In 1914, not only was the aircraft industry in its infancy and barely emerging from its first flutterings and the aero engine industry had hardly been established at all in this country, but, generally, knowledge of the aeronautical sciences was very rudimentary indeed. Production had to be built up whilst, simultaneously, entirely new designs had to be investigated. Quantity production, under such conditions, was very costly, and was seriously hindered by the premature introduction of standardisation.

Handicaps of this nature do not now hamper the industry to the same extent, and, to-day, the main difficulties of quantity production were tackled before the outbreak of war. A vast organisation has already been built up for producing aircraft and engines on a large scale. Not only was this organisation in practical operation before the war, but it was planned so that it could be rapidly expanded on an unprecedented scale.

Big volume production of aircraft is, however, of little value unless it is backed by the most advanced scientific knowledge. Discrepancies between opposing aircraft were the main causes of the ebb and flow of air supremacy during the last war. Such wide variations are not so likely to occur in the present conflagration, as the basic principles of design are too well understood and diffused for large differences to be expected.

Further, the introduction of the all-metal stressed skin aircraft necessitates extensive tooling and equipment. These facts, combined with the much larger quantities, have necessitated the freezing of design of both aircraft and engines for much longer periods.

Research has become more ponderous and elaborate as refinements tended to become increasingly directed to details. It is well known that during the last war, the Liberty engine was designed and built within a few weeks. Such a feat cannot be conceived as possible to-day. It took over ten years of continuous research to bring the Bristol sleeve-valve engine to the full production stage.

Engine types are becoming much more stabilised, and the field of sensational experiments is becoming restricted. It should not, however, be inferred from these remarks that the ultimate limit of development has been attained, and that a period of stagnation is imminent. Research is more vital to the aeronautical industry than it ever was, because of the care with which even minor points must be investigated, and because of the large issues at stake with the very much larger production. It has developed from a haphazard series of inspired experiments into a systematised sequence of tests.

Research

The scope and cost of these investigations has increased so enormously that even the leading firms are unable to afford research departments adequate for their requirements. In all countries having an aeronautical industry, Government aid has to be given to subsidise research. Money spent in this way has far-reaching influences, but the delay before the consequences are apparent is becoming increasingly great. Long-term research on a large scale is now an essential preliminary to all aeronautical designs, and vital to our national interests.

The inevitable consequence of these developments has been the considerable cost of producing new engines, and so the number of different types on the market is relatively small. The liquid-cooled twelve cylinder Vee and the air-cooled radial are the outcome of a long ancestry of gradual evolution, and these types are specially comformable with the Air Ministry's policy of standardisation. Normal evolution of both types is still continuing actively, but the developments are not likely, at any rate during the period of the war, to be such as to interfere drastically with the principles of standardisation.

The radial engine, for instance, is such a versatile type that it will be in widespread demand for many years to come. On a weight to power ratio, it is not likely to be surpassed by any other type. Its geometry is such that the stressing is simple, the design compact, and the material obtainable in large quantities. Special machine tools are not essential for the manufacture, and the problems to be solved are mainly straightforward. The layout is such that assemblies can easily be isolated for efficient production by sub-contractors, and the engine is, therefore, eminently suited for extensive shadow production.

These comments apply with special significance to the sleeve-valve air-cooled radial, which is, undoubtedly,

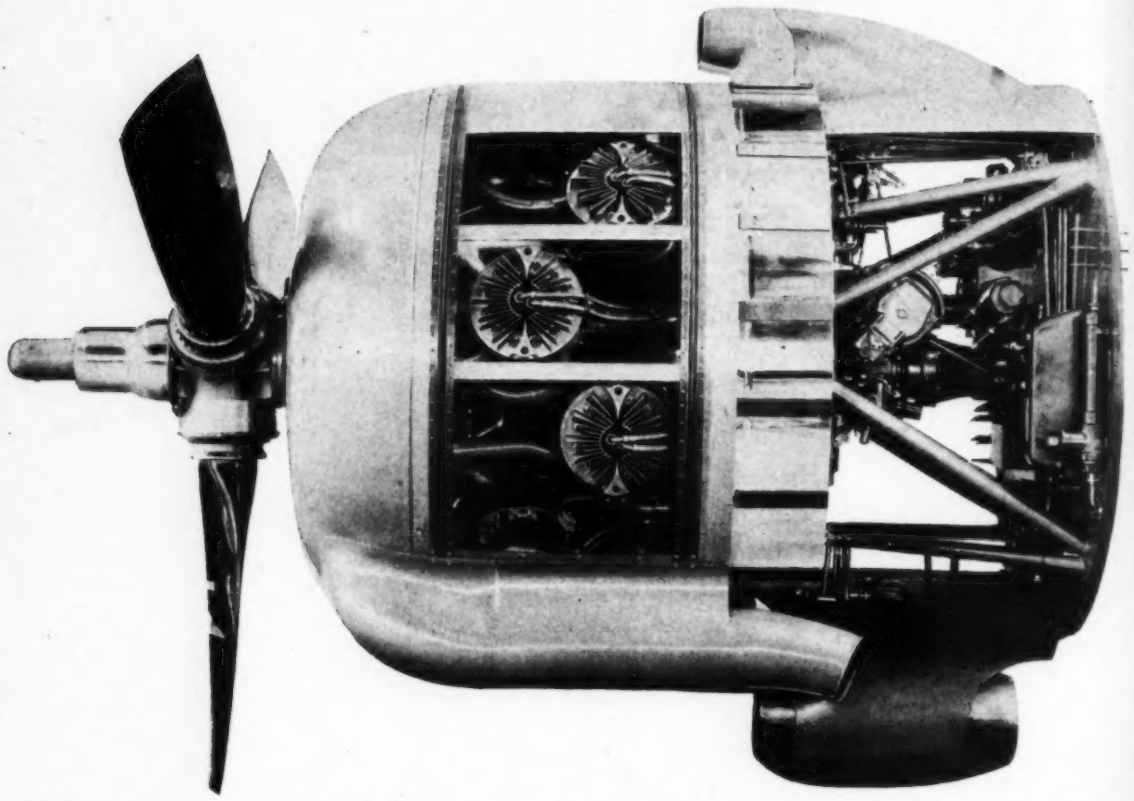


Fig. 1.—In wartime easy interchangeability of power-units is all important. Bristols were pioneers of the interchangeable engine. Above is shown a complete Bristol sleeve-valve power-unit, the 14-cylinder Hercules, which has a drive leading back to the separate accessory gear-box on the fire-proof bulk-head.

more attractive for wartime quantity production than any other known and developed type of engine.

Even though standardisation has increased so markedly, it is noteworthy that simultaneous production is proceeding on a wide scale of two classes of engines so radically different as the air-cooled radial and the water-cooled in-line type. This state of affairs is very satisfactory because both types have their distinct uses, and the day when one type will eliminate the other is no more in sight now than it ever has been. It may even be said that the friendly rivalry is beneficial to them both, and the competition it affords stimulates engineers to greater achievements.

In this connection, I should like to deprecate the opinion expressed by Mr. F. R. Banks* that for powers in excess of 2,000 to 2,500 b.h.p. the liquid-cooled engine will be more generally used. Air-cooled engines of the multi-bank radial types, and of the "X" and "H" types are possible in large sizes, and the problems involved are no greater than when liquid cooling is employed. The provision of cooling ducts and of sufficient cooling surface can be overcome, and the installation can be arranged so that the drags of both types of engines are almost exactly comparable. Furthermore, the cooling of a cylinder by air is a problem which is still being actively pursued, and new developments are much more likely in this direction than in that of the more fully developed liquid-cooled cylinder. In this respect the recent N.A.C.A. experiments with cylinders of large cooling surface† may be quoted;

> "By increasing the fin area of a standard head six times, and by doubling the cooling surface of a barrel, the power obtainable from a cylinder of given size has been trebled without increasing the cooling loss or the temperatures."

This development is only an indication of one direction in which progress seems possible. Other problems, connected, for instance, with baffles or cowling, still offer considerable scope for ingenuity, and installations are gradually tending towards the completely buried engine. The fact that the air-cooled engine has more than double the heat differential of the liquid-cooled engine must never be lost sight of, and may play a big part in certain future types of installations.

Up to 4,000 B.H.P.

The demand for increased powers for heavier and faster aircraft continues both for civil and military use. The double row air-cooled radial can easily give the 2,000 B.H.P. which aircraft designers are already beginning to demand, but power plants for 3,000 and 4,000 B.H.P. will eventually have to be contemplated, and can be met by developments of the same technique. They will be obtained both by increasing the output per litre and by multiplying the number of cylinders. The optimum size of cylinder is determined by considerations of weight and cooling requirements, and is not likely to vary greatly from the present standards.

The problems to be overcome in creating these larger engines are not so much the sphere of the engineer as those of the financier and the politician. Perhaps the

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* *S.A.E. Journal, September*, 1939, *page* 401.

† *Journal of Aeronautical Sciences, October*, 1939, *page* 481.

WAR—AND THE DEVELOPMENT OF THE AERO-ENGINE (CONTINUED)

greatest engineering difficulties may even be those of the airscrew designer. The engine designer is mainly concerned in new aspects of well-known problems. For instance, the distribution problems associated with complicated manifolds will have to be carefully studied, and they may possibly be solved only by resorting to fuel injection.

This method of carburation has been "in the air" for a considerable time, but the advantages it has offered have not been quite sufficient to overthrow the well-established carburetter. The wide and rapid adoption of petrol injection in Germany has proved that the method is practicable, but the conclusion should not be drawn that the continued popularity of the carburetter in this country signifies that injection has been overlooked.

Perhaps the branch where the developments are most needed is in the realm of superchargers. With the simultaneous demand for high boosts and high rated altitudes, the duties of the blower have increased immensely of recent years, and the rapidity with which two-speed blowers have been produced by a variety of firms is ample evidence of the topical nature of this question. The two-speed blower has not, however, finally disposed of this subject, and we may expect a crop of new schemes from all countries.

Advantages of Sleeve Valves

In all the fields of development I have mentioned it is my opinion that the sleeve-valve is going to play an important part. For instance, the control of turbulence it affords is an important asset for petrol injection. The absence of hot spots in the combustion chamber is an advantage when the utmost performance is to be obtained by boosting. The sleeve-valve should also be particularly suited for operation in an engine using a turbo-blower because it should, without difficulty, be able to withstand the higher temperature involved. For some twelve months now the sleeve-valve aero engine has been in regular production and has been living up to expectations. The four-engined Imperial Airways' flying boats which so successfully carried out regular trans-Atlantic crossings this summer relied entirely on the sleeve-valve engine for their power plant.

One of the main claims of the sleeve-valve exponents is that their engines require no servicing except routine plug inspection. This claim has been answered by several poppet valve enthusiasts, and figures have been quoted to substantiate the argument that their type of valve has been known to give equally satisfactory service. It must be recognised that the sodium-cooled exhaust valve has reached a remarkable stage of development which would have been considered unbelievable a

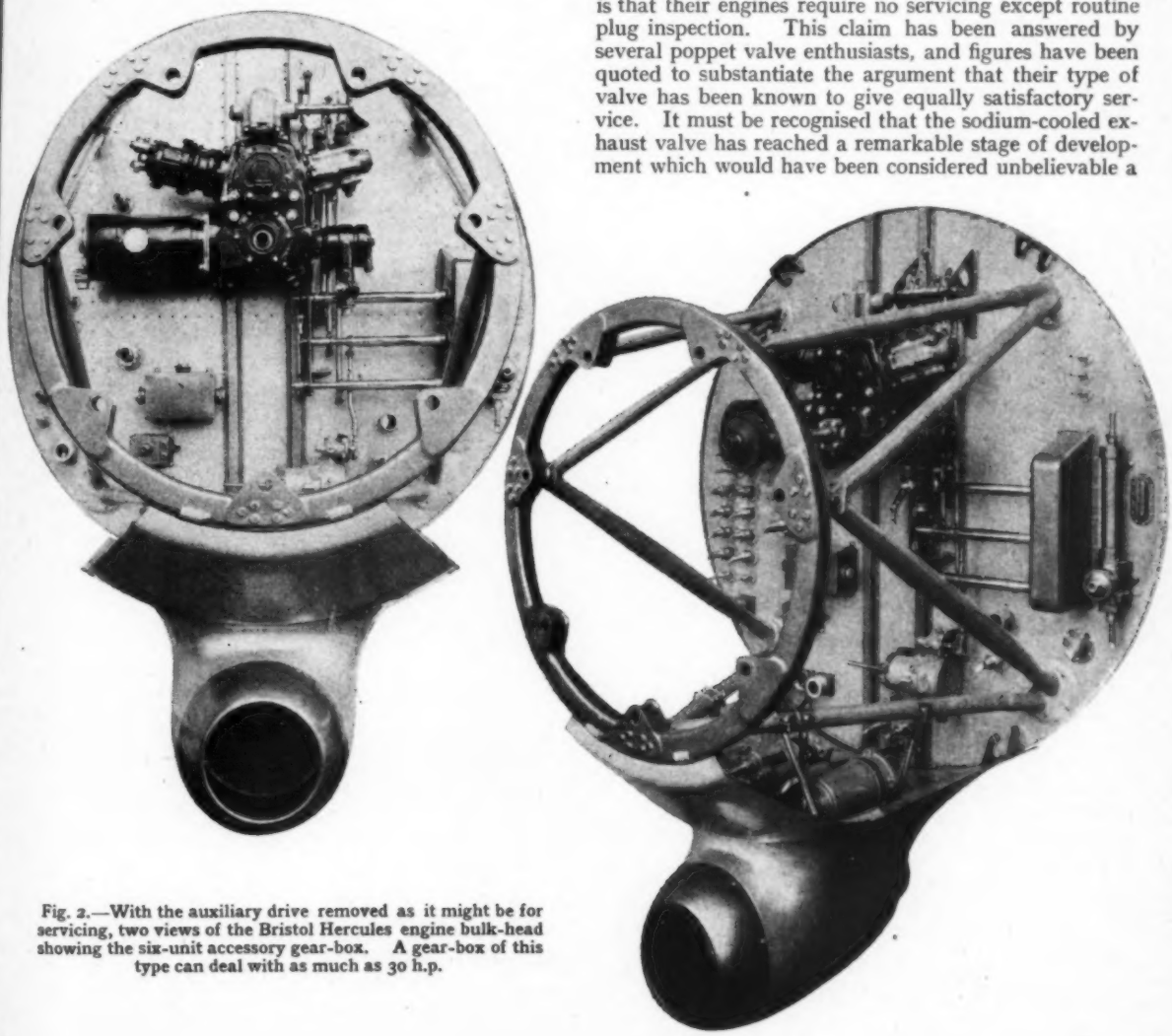


Fig. 2.—With the auxiliary drive removed as it might be for servicing, two views of the Bristol Hercules engine bulk-head showing the six-unit accessory gear-box. A gear-box of this type can deal with as much as 30 h.p.

WAR—AND THE DEVELOPMENT OF THE AERO-ENGINE (CONTINUED)

few years ago. This does not, however, alter the fact that the sleeve-valve needs no attention whatsoever between servicing periods. Even the best poppet valve requires its clearance to be tested occasionally, and the valve springs to be checked, although no adjustments may be necessary. With modern tightly cowled engines this routine must take up appreciable time.

Another point to remember is that even though the poppet valve can be operated for long periods without attention, its condition does deteriorate gradually, and during servicing, however good the valves may be, the opportunity is taken of re-cutting the seats with special tools and equipment. It does not seem to be generally appreciated that the performance of a sleeve-valve engine varies very little with time, and usually tends even to improve.

Another important advance in the direction of easier servicing is undoubtedly the interchangeable power unit. Such a system was pioneered some 16 years ago by the Bristol Company, but it was before its time and did not receive the support it warranted. The scheme offers a considerable saving of the time during which an aircraft is out of commission for changing engines, whilst the problem of stores equipment and organisation are greatly simplified.

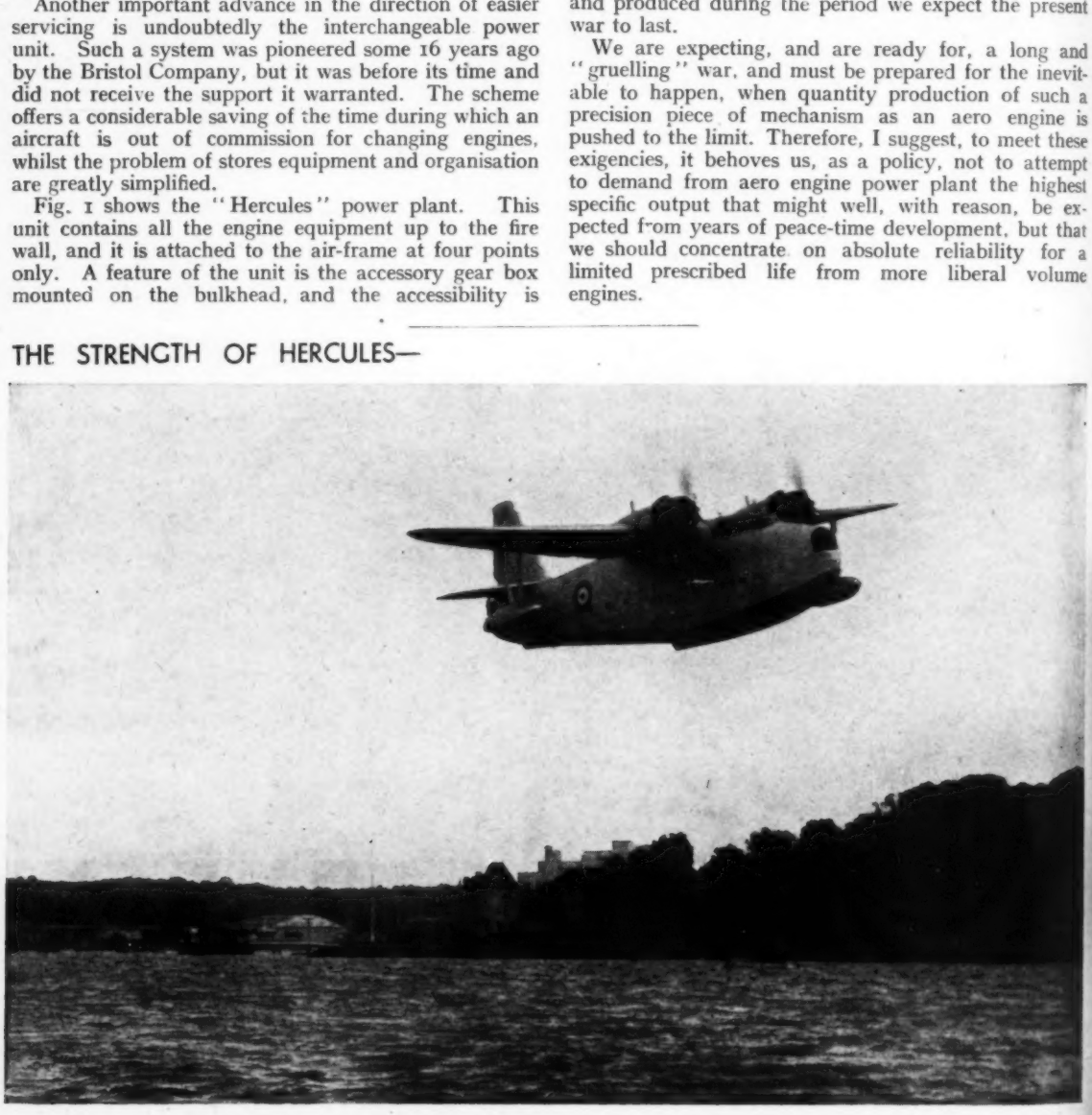
Fig. 1 shows the "Hercules" power plant. This unit contains all the engine equipment up to the fire wall, and it is attached to the air-frame at four points only. A feature of the unit is the accessory gear box mounted on the bulkhead, and the accessibility is thereby greatly improved. A recent gear box (Fig. 2) of this type is arranged for six drives, and can deal with as much as 30 h.p. This figure indicates the increasing importance of the accessories on a modern aero engine.

Aero engine design has now reached such a stage of development that progress must be largely the result of systematic research in a wide variety of sciences. Fuel research and metallurgy, for instance, have both been important factors in recent advances. To co-ordinate the latest contributions of these sciences is the task of the designer, and a long period of preliminary research must precede each new development.

Progress along these lines is of vital importance, and will proceed in spite of the war. It is not, however, to be expected that radically new designs can be conceived and produced during the period we expect the present war to last.

We are expecting, and are ready for, a long and "gruelling" war, and must be prepared for the inevitable to happen, when quantity production of such a precision piece of mechanism as an aero engine is pushed to the limit. Therefore, I suggest, to meet these exigencies, it behoves us, as a policy, not to attempt to demand from aero engine power plant the highest specific output that might well, with reason, be expected from years of peace-time development, but that we should concentrate on absolute reliability for a limited prescribed life from more liberal volume engines.

THE STRENGTH OF HERCULES—



A Saunders-Roe Lerwick high-speed, long-range Service flying boat powered with two Bristol Hercules fourteen-cylinder, two-row sleeve-valve engines designed by Mr. A. H. R. Fedden, the author of the article above.

THE OPPOSING FIGHTERS

The Hurricane's Designer on the Messerschmitt : Allied and Enemy Single-seaters Compared : Accent on Fire-power

"*Flight*" photograph.

The Hurricane, extremely manoeuvrable, very fast and a veritable flying arsenal. In this article its designer comments on the Messerschmitt.

THE daily papers have been saying some unflattering things about the flying qualities, strength, and armament of the Messerschmitt Me 109, the German fighter which has been chiefly employed on the Western Front. It is said that its wings come off in a fast dive; that even when they stay put they flutter; that the ailerons and tail flutter also; that the machine is not nearly so manœuvrable as Allied types; that it cannot be flown at night; and that its armament is inferior. In all, a pretty useless aeroplane. Certainly, it is reported to have shown up rather badly against Allied fighters.

Flight, like other aeronautical publications, has said some very nice things about the machine, based on information available at the time. For example, we recall writing: "There can be no doubt that the Me 109 is a delightful machine to fly. 'Al' Williams, who was permitted to play with one in Germany, waxes lyrical about its handling qualities . . ." It is legitimate, of course, to assume that the machine was being flown without military load and that it was, in any case, the more lightly loaded type with Junkers Jumo 210 engine.

Regarded purely as a flying machine, the Messerschmitt may not necessarily be worse than was originally believed. It may be that the Hurricane and other Allied fighters are even better than we thought, and anyone who (like General Milch) saw Mr. Reynell's astonishing display at Evere this year knows how the Hurricane can perform.

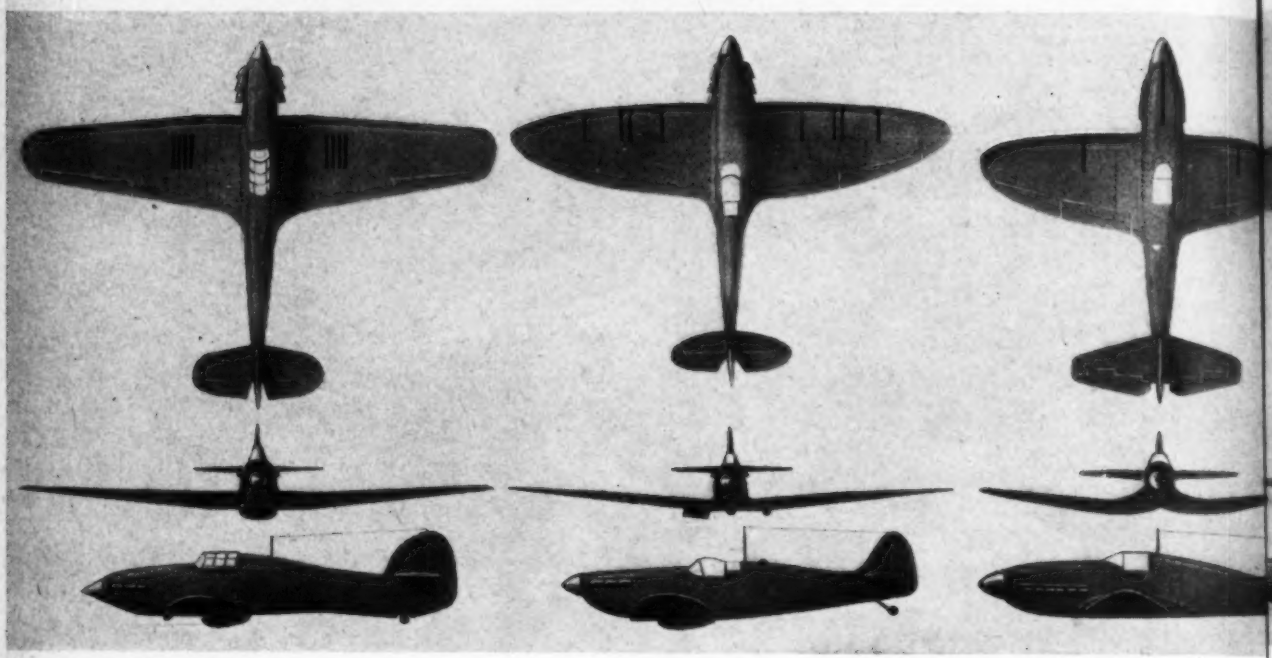
We have been fortunate enough to get Mr. Sydney Camm, the designer of the Hurricane, to jot down, in conjunction with his technical staff, some observations on the Me 109. Mr. Camm writes:—

"It seems that the differences between our own fighters and those of the enemy are not really appreciated.

"In the first place, our fighters are designed to carry eight machine guns; the enemy has been satisfied with four. Consequently, right at the start the design of the two machines will vary. It is quite obvious that a machine designed to take eight machine guns will be larger and heavier than one designed to take four. This is well demonstrated in the overall dimensions of the various machines; e.g., the span of the Messerschmitt is 32ft. 6in.; that of the Heinkel He 112 is 29ft. 10in.; the Spitfire measures 37ft., and the Hurricane 40ft. 6in. For the same degree of cleanness, therefore, the smaller aircraft should be faster.

"There is another aspect of this question: our fighters are required to fly at night, and take-off and landing will be considerably affected by wing-loading. Thus the wing-loading of the Hurricane is round about 24 lb./sq. ft.; the Heinkel is approximately 34 lb./sq. ft., and the Messerschmitt about 32 lb./sq. ft. It is obvious that the German machines will require a longer take-off run and

A Messerschmitt Me 109. This machine may not be as formidable as many people believe but is certainly not so bad as others are trying to make out. The type shown is the earlier version.



HAWKER HURRICANE I. Rolls-Royce Merlin engine of 1,050 h.p.; eight machine guns; 330 m.p.h.

SUPERMARINE SPITFIRE I. Rolls-Royce Merlin engine of 1,050 h.p.; eight machine guns; 367 m.p.h.

HEINKEL HE 112 (latest type). Daimler Benz DB 601A of 1,150 h.p.; armament uncertain; 370 m.p.h. plus.

will land at a much higher speed than the Hurricane.

"In designing a fighter one has to think of other things than sheer maximum speed. From examination of some of the details of the Messerschmitt and Heinkel, I am quite certain that their strength factors are seriously below ours, and I am quite sure that neither type would comply with our own official strength requirements.

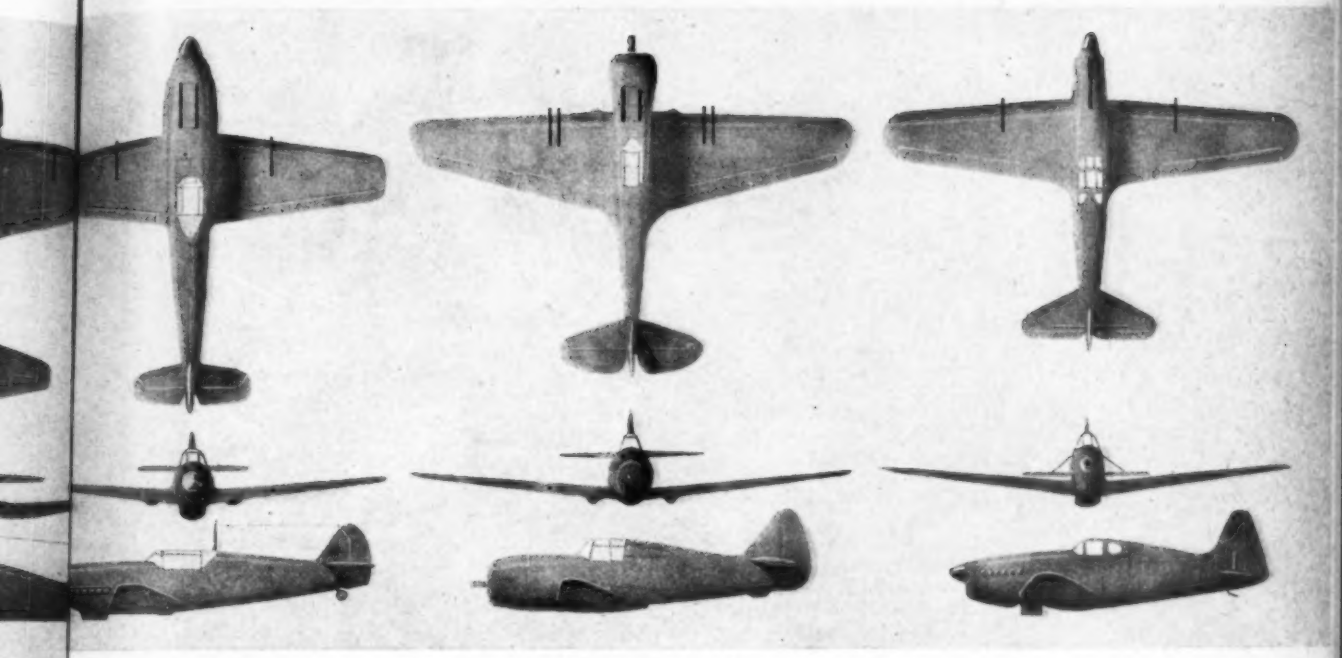
"The maximum level speed of the Messerschmitt should be higher than that of the Hurricane, given the same horsepower at the same height. But the maximum power altitude of the Me 109 is given as 5,200ft. lower than that of the Hurricane, although the DB 601 engine is quoted as giving 100 h.p. more than the Merlin. Thus the Me 109 has a deficiency of 7½ per cent. maximum speed to regain by less skin area and cleanness of design to achieve the same speed as the Hurricane.

"As far as can be gathered from the dimensions quoted, the skin area of the Me 109 is 160 sq. ft. less than the Hurricane, which means a gain of about 7 per cent. in maximum speed. Even this does not make the Me 109 as fast as the Hurricane. So where is this superior performance which is claimed by the published figures?"

Here we would interrupt Mr. Camm with the statement that *Flight* credited the Me 109 with Jumo 210 engine with 285 m.p.h. and the version with DB 600 engine with 323 m.p.h. The Hurricane does 330 m.p.h., and the latest Me 109 with DB 601 engine should not be much faster.

The Morane 406 (left) is being built in great quantities and has had a number of successes. It is said to be more manoeuvrable than the Me 109 and is armed with one shell-gun and two machine guns.

(Right) One of France's American-built Curtiss Hawk 75As with Pratt and Whitney Twin Wasp engine. This machine is extremely popular and is armed with six machine guns.



MESSERSCHMITT ME 109. Daimler Benz DB 601 of 1,150 h.p.; four machine guns (shell-gun optional); 340 m.p.h. plus.

CURTISS HAWK 75A. Pratt and Whitney Twin Wasp of 950 h.p.; six machine guns; 317 m.p.h

MORANE 406. Hispano Suiza 12Y of 860 h.p.; one shell-gun and two machine guns; 310 m.p.h

Mr. Camm proceeds: "It (the speed) is certainly not obtained by aerodynamic cleanness. No one would call the Messerschmitt a clean aircraft. Take, for instance, this list of excrescences which are not to be found on either the Hurricane or the Spitfire: three separate radiator ducts; guns protruding from the leading edge; aileron mass balances; blisters on the engine cowling; tail-raking struts; extra (diagonal) aerial wire; gun troughs in the top cowling; and gun discharge chutes.

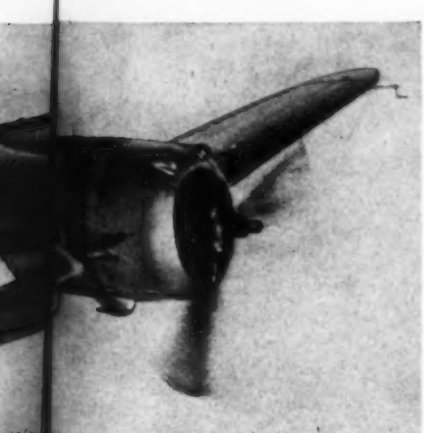
The Me's Undercarriage

"The method of retracting the undercarriage appears to be a very inferior job, and reports from a neutral country equipped with these aircraft state that the undercarriage has to be inspected and serviced after every two landings.

"It is understood that an Me 109 which made a forced landing in France was flown by French pilots until it was eventually crashed, and was found to be most unsatisfactory for night-flying. This, of course, is understandable, having regard to the apparent landing qualities.

"Moreover, we are told that it is consistently outmanœuvred by Allied fighters, and, owing to the liability of partial stall in a high-speed turn, it appears that it can be evaded by our medium bombers.

"From several sources we learn also that this German



The Supermarine Spitfire which, as a compromise between speed, armament and manoeuvrability, is unexcelled by any single-seater in general use. Like the Hurricane it has eight wing-mounted Browning machine guns. The top speed is 367 m.p.h. at a height of 18,400ft

"*Flight*" photograph.

The Opposing Fighters (Contd.)

fighter is prone to wing flutter, which must go far to destroy the pilot's confidence in his machine. At the price, perhaps, of some small increase in weight the British fighters are given sufficient stiffness so that flutter considerations do not constitute any effective limitation."

Let us now add a few observations of our own.

The French pilots who tried out the captured Me 109 against the Curtiss and Morane reported that on the score of manœuvrability it was inferior to both types. When the Curtiss and Morane were put up against the Hurricane, each showed up at a disadvantage against the Hawker, which, on this basis should be able to out-fly the Messerschmitt quite comfortably. This inferior manœuvrability is the reason usually given for the initial successes of the French fighters over the Messerschmitt. Weight is lent to this theory by reports from Spain that the stubby, though comparatively slow, Russian Rata fighters could beat the Me 109s.

A *Distinguished Forerunner*

We have already quoted "Al" Williams' enthusiastic comments on the Messerschmitt's flying qualities. Another point is that the Me 108 cabin machine is exceedingly nice on the controls and was, in fact, described in *Flight* as "something exceptional." The machine has the square-cut wings, Handley Page slots and slotted flaps of the Me 109. It would, of course, be foolish to conclude that on this basis the high-powered fighter could be just as nice, but it does seem strange that a man with the ability of Professor Willy Messerschmitt should produce a very poor aeroplane immediately after an exceptionally good one. The success of one of his Me 110 heavy twin-engined fighters over an Allied single-seater must not be overlooked.

When a journalist telephoned him recently from a neutral country and asked for his observations on the derogatory accounts of the Me 109's behaviour, the German designer replied that he had heard the criticisms, but had had other reports.

Whether or not the Me 109 is regularly flown at night we do not know, but night-flying gear is certainly fitted. The high wing-loading will undoubtedly make for a high landing speed and the effect of the Handley Page slots and slotted flaps may not altogether compensate for this. We can, however, ignore people who have said "The Messerschmitt must be a bad aeroplane; it's covered with slots and things."

There was a report during the Spanish War that the first Me 109s to go into action shed their wings. If this is true, one may assume that the machines have since been strengthened. Certainly the Hurricane and Spitfire are strong enough to meet any contingency which may arise in aerial combat. Neither can there be any doubt of the sturdiness of the Curtiss, for one of the machines for *L'Armee de l'Air* was dived on test at 575 m.p.h., though one has heard that when one of these machines was dived by a French pilot at about 500 m.p.h. some small inspection doors blew oft. The Morane is another sturdy design and should stand up to more or less anything.

Armament

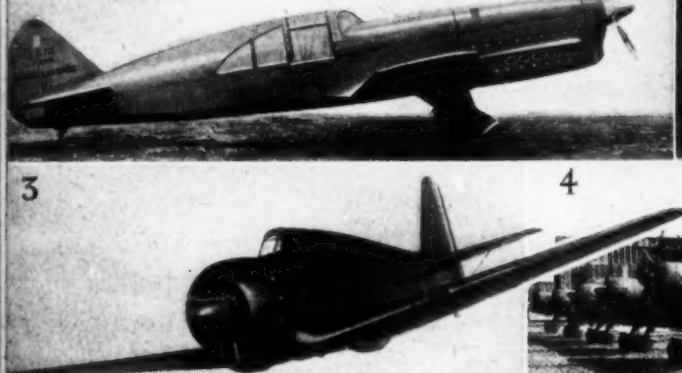
Here it may not, perhaps, be out of place to recall that some years ago, when Messerschmitt was at an earlier stage of his career and had less experience than he has now, his machines were "grounded" because they had broken their wings shortly before the start of a big air race. It may be that something of his early fondness for lightness still clings to him.

Some surprise has been expressed that the Me 109s brought down on the Western Front have been found to carry only four machine guns and no shell guns. It was immediately assumed by some people that these aircraft are not suitable for mounting the heavier weapon. This is a false assumption, as many of the machines in service have a single shell gun fiving through the airscrew hub in addition to their machine gun armament, and possibly some mount twin shell guns in the wing in addition to a pair of synchronised machine guns

One gathers that the Germans have had some bother with over-heating in their Daimler Benz and Junkers "cannon-engines" and that they often load their shell gun magazines with ball ammunition which might indicate that they have been having trouble in making the fuses for their shells, though with their reputation for precision work this is difficult to understand.

The Me 109s with four machine guns carry a great deal of ammunition, particularly for the weapons in the wing, considerably more, in fact (per gun) than our eight-gun fighters. Incidentally, an interesting point is

(1) The little Caudron C.713 which does nearly 300 m.p.h. on 450 h.p. It is in production in France, but may be used as a trainer. (2) The new Dewo'tine D.520 which is capable of 330 m.p h. (3) With a Gnome Rhone 14N the Bloch 151 does well over 300 m.p.h. (4) France has taken delivery of Koolhoven F.K.58s as shown It does about 315 m.p.h.



that the guns are very silent. The devastation wrought on Do 17s and He 111Ks by the rifle-calibre Brownings mounted by the Hurricane and Spitfire augurs badly for any Messerschmidts which may become involved with them.

The French are now fitting six Brownings on their Curtiss Hawk 75As in place of the four originally installed. Two of the guns are synchronised; the other four are wing-mounted. It is not considered safe to carry incendiary ammunition for the fuselage guns due to their proximity to the engine, so this is allotted to the free-firing weapons in combination with tracer, while the synchronised guns fire armour-piercing bullets.

The Curtisses have no shell guns though it would easily be possible to fit these. In fact, two 23 mm. Madsens have been fitted to a Hawk 75A in America. In accordance with the new French practice the Curtisses have a sheet of armour plating behind the pilot's cockpit.

The Morane is armed with a Hispano Suiza 20 mm. *moteur canon* and two drum-fed rifle-calibre Chatelleraut free-firing machine guns. The magazine of the shell gun holds sixty rounds and the Chatellerauts have plenty of ammunition in their big drums.

One has heard some encouraging reports of the marksmanship of the French fighter pilots. One, in a Morane, once managed to get all his *canon* shells (or rather solid ball 20 mm. bullets which are used for practice) on the drogue target plus all the rounds from his Chatelleraut guns. A few weeks ago another Morane pilot managed to put a shell into a Messerchmitt's petrol tank whereupon the Me virtually disappeared in mid-air.

The Bloch 151 now coming into service has two wing-mounted shell guns and the little Caudron light fighter can have similar armament, though the latter machine may be used for training.

The French, like ourselves, have gone to great pains to evolve fire control gear which will give a minimum of time lag between the pressing of the firing lever and the firing of the guns and the release of the lever and the cessation of firing.

All fighters now operating have reflector sights. The French one is of very advanced design, but like all of its kind is chiefly of value in attacking bombers, as the adjustment takes time and concentration. The old ring and bead sight is still used for dog-fighting.

The story of the much-maligned Messerschmitt is not yet finished, but we certainly know enough not to worry about the chances of our superb Hurricanes and Spitfires, France's beloved Curtisses and the handy Moranes. H. F. K.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"NOT GUILTY"

Moore-Brabazon's First Machine

THERE has been published recently the autobiography of an old acquaintance of mine, Sir Alliott Verdon-Roe, one of the pioneers of aircraft design and construction in this country.

Having purchased a copy of the book, I was surprised to read his statement on page 41 that Short Brothers had built for Mr. J. T. C. Moore-Brabazon (now Lieut.-Col. Moore-Brabazon) an aeroplane fitted with a "Bouchet" engine which the owner attempted to fly in the year 1907. Sir Alliott goes on to describe the flimsy structure of the machine and how its chassis collapsed when it was merely standing in its shed, and how it again collapsed after it had been repaired as its owner was trundling it along the ground at two miles per hour in an attempt to take off and fly.

For the sake of historical accuracy may I place it on record by this letter (which you may be kind enough to publish) that Short Brothers did not build a power-driven aeroplane in that year for Mr. Moore-Brabazon.

The first power-driven aeroplane we built for Mr. Moore-Brabazon was what we called Short No. 2, Short No. 1 having been built to the order of Mr. Frank K. McClean (now Sir Francis McClean).

Piloting Short No. 2, Mr. Moore-Brabazon, the owner, on its first flight won a prize of £1,000 offered by the *Daily Mail* for the first all-British aeroplane to fly one circular mile and return to its starting point.

No one wants to belittle the pioneer aviation work of Sir Alliott Verdon-Roe in this country, but I venture to suggest that he will not enhance his own reputation by belittling the work of other contemporary pioneers by statements of supposed fact which cannot be substantiated. H. O. SHORT.

Rochester.

THE AIR CADETS

An Appeal

A GREAT many people throughout the country take a personal interest in the welfare of the Air Defence Cadet Corps.

I would very much like to be given the opportunity of stating that out of forty-seven squadrons formed in the London area all are going well.

This is a great credit to the various squadron committees and officers, for it must be admitted in many cases they are up against lack of funds and instructors.

There can be no doubt but that the cadets are rendering great service to our country.

May I appeal to anyone who would act as an instructor or give a talk on air matters to any one of the squadrons near where he lives to write to me.

H. W. WOOLLETT
(London Area Organiser).

SHOWING THE WORLD

(*Continued from page 488*)

time was rather short for the tour of the factory, but however brief the visit no one could ever glance at that five hundred yards of wing jigs and its companion five hundred yards of erection shop without being very impressed by the magnitude of Britain's effort. Despite the fact that black-out time was within a very few minutes, and the cloud base was no more than two hundred feet up, Flt. Lt. Turner-Hughes, Armstrong Whitworth's chief test pilot, put up quite a show on a Whitley bomber to amuse the guests, who were undoubtedly impressed by all they had seen in a crowded three days.

And so we have shown the world just a small something of our aerial effort in the fight against "evil things." From here the foreign journalists were going on to see guns, shells, tanks, ships and all the other paraphernalia of war in the making. We are certain they will be equally impressed and, when back in their own cities comparing notes with colleagues who have been to the other side, will feel a certain pride in asserting that what *they* have seen is the biggest ever.

3,000 h.p. "H" Engine

A NEW type of engine, stated to be of 3,000 h.p., is reported by our contemporary *American Aviation* to be under development in Michigan. It is a 24-cylinder of H layout in which no aluminium is used; it is all steel. Weight is 2,800 lb., and specified fuel consumption .42 lb./h.p./hr. at 2,250 h.p. This unconventional design can take an airscrew at each end, so that the engine axis is at right angles to the fuselage axis.

Full-feathering Airscrews Recommended

THE Civil Aeronautics Authority has been given a recommendation by the Air Safety Board that all transport aircraft should be equipped with full-feathering airscrews. The Board makes this recommendation as a result of their investigation into accidents caused by the failure of one engine. The great reduction in drag on the "dead" side must add greatly to control and to rate of climb, which would be especially valuable if the failure occurred just after take-off. The Board also recommends the installation of quick-release safety belts and a substantial reduction in engine-power output of transport planes. They believe that powers being taken out of engines for take-off, climbing and cruising are too great and that the accident rate has increased because of this.

WAR in the AIR

King George VI in France : Decorations on the Field : Air Warfare in Finland : Pilot's Story of Historic Combat

HIS MAJESTY THE KING crossed over to France last week to visit the B.E.F. and the Royal Air Force over there. He was received with great enthusiasm. In the course of his tour he visited an aerodrome, and there a young officer who had shot down a Heinkel He IIIK over the Channel a few days before was presented to His Majesty. The King is reported to have remarked, "Jolly good show! That's fine! Let's hope it goes on like that." The "readiness flight" on the aerodrome took off and circled round until the King had left.

His Majesty decorated General Gamelin with the G.C.B. and General Georges with the O.B.E. The King also presented British decorations to a French officer, two French soldiers and a French airman for acts of gallantry in the field. On the morning of Sunday, December 10, the King returned to England, having spent six days in France.

Over North Germany

ON the evening of Wed., Dec. 6, the R.A.F. (according to the Germans they were in strength) made a reconnaissance flight over North Germany. The German wireless stated that our machines flew over the Friesian Islands and Schleswig-Holstein, and the official German News Agency added that, "according to unimpeachable observers, the aeroplanes flew over Danish territory, thus adding to the list of unscrupulous British violations of neutrality." The Air Ministry denied this, and the Danish Foreign Office said that it had no knowledge of it.

Enemy reconnaissance activity has continued all over the North Sea ever since our last issue, and there have been frequent encounters with them. The landplanes and flying boats of the Coastal Command do not hesitate to attack the enemy reconnaissance machines whenever they meet them, and seldom fail to report a success. On the evening of Wednesday, the 6th, while our machines were over Germany, some enemy aircraft, probably seaplanes laying mines, appeared off our East Coast, and this time fighters were sent up. The weather, however, was very thick, and no interception was made. Next morning the wreckage of a Heinkel He 115 seaplane was washed up near Sheringham, on the coast of Norfolk, and soon after the body of the pilot was also washed up. The machine crashed soon after 3 a.m., having narrowly missed a gasometer and several other buildings. There were no marks of bullets on it, and there was no sign of any member of the crew except the pilot. His body was buried with military honours.

While this took place off the East Anglian coast there was fierce fighting elsewhere. Soon after midday nine enemy aircraft were signalled as heading for the Firth of Forth. The fighters in that area, now seasoned warriors, were up at once and headed out to sea. They made interception at the coast, and, of course, the enemy at once turned tail, having a very wholesome respect for the eight-gun fighters. Five of the enemy were seen to be hit. Two German Heinkels were first observed flying almost at sea level below a British fighter patrol. The fighter dived and gave the enemy several bursts of fire, chasing them eastward. Soon afterwards the seven Heinkels were seen and attacked as they were flying south down the coast in close formation. A British fighter patrol drove them down to sea level, and one pilot carried out a running attack 15ft. above the water. A second pilot hit one of the enemy aircraft and then attacked a second, which returned the fire. This raider also appeared to be hit. A third British pilot tackled two Heinkels, registering hits on one. The fourth fighter pilot had a narrow escape. He had seen his bullets hit a Heinkel when he himself was hit by cross-fire from another aircraft. One bullet pierced his earphones and wounded him in the ear. A second hit him in the left thigh, a third pierced the petrol tank. Although dizzy from loss of blood he managed to return safely.

A Running Fight

THE Heinkels, speeding south, encountered a patrol of three British fighters five minutes later. Two of the British fighters hit two of the Heinkels. The enemy machines, five of them holed by bullets, disappeared into the mist on their difficult journey home.

The British pilot who was wounded was born in Sydney, and learned to fly in Australia. He led the first attack in

WAR IN THE AIR (CONTINUED)

an action fought some weeks ago over the North Sea, as a result of which seven out of 12 enemy aircraft failed to reach home.

Those of our readers who have seen the film *The Lion has Wings* will be able to understand the excitement of the chase, and will remember the expression on the face of the German leader when his gunner reports to him "Spitfires." On this occasion an alarm was sounded, and the "raiders passed" was given after half an hour.

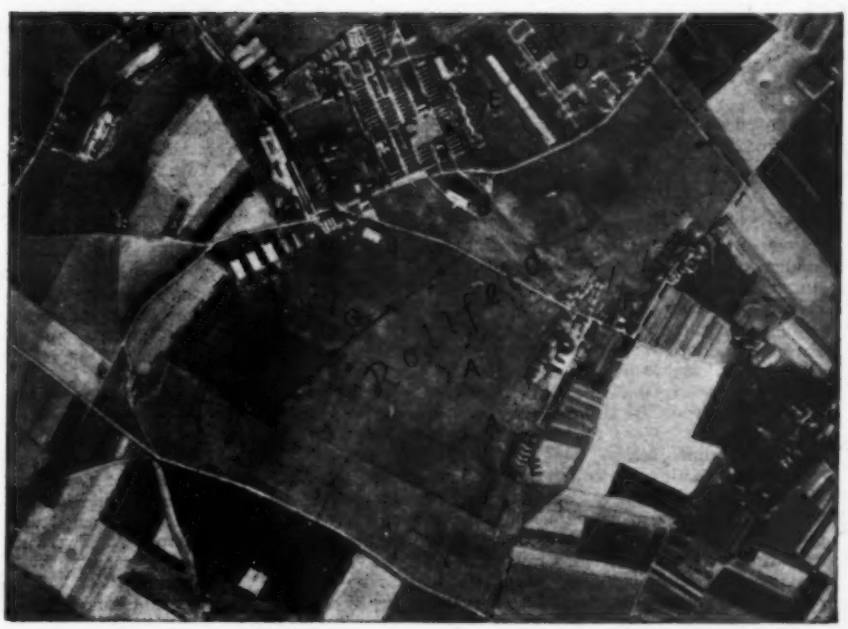
As usual, the Coastal Command machines were out, scouring far and wide over the North Sea that day, and one of them met a Dornier Do 18 twin-engined flying boat and put bursts into it from both front and rear guns. Fuel oil was seen to be pouring from the Dornier, and it was thought highly improbable that it could have got home safely. A second Dornier, type unspecified, but probably also a Do 18, was pursued by another Coastal machine, and the latter gave it several prolonged bursts of fire. It was hit in an engine and in the mainplane, but disappeared in the clouds.

That day one of our machines did not return. The Germans gave a clue to what may have happened. They said that two of their machines met a British machine near the island of Texel. Their account says: "A fierce fight ensued, which ended in one of the German aircraft driving full tilt at the British machine. Both fell in the sea, and the crew of the German were picked up by a German trawler."

Some information has been made public about the work the Coastal Command does in helping the Navy with convoy work. One day recently the weather was very bad, with visibility practically nil, and a machine was sent out to locate the convoy. After searching an area fifty miles square, the pilot found himself just over the masts of part of the convoy, but only about two-fifths of them were there. The escorting destroyers told him that a threatened submarine attack had caused the convoy to disperse. The rest of the ships were found in two distinct groups, and the pilot guided them all together, remaining overhead until the whole convoy had reassembled. That convoy was carrying 100,000 tons of foodstuff.

Rescue in the North Sea

SEVEN sailors, survivors of a ship, whose identity is not yet known, have been saved in the North Sea by the crew of an R.A.F. Coastal Command aircraft. The navigator of the aircraft, which was returning from patrol at 600ft. to its base in Scotland, saw two small objects half a mile away on the starboard bow. The black specks on the water were at first believed to be mines, and the pilot prepared to destroy them with machine-gun fire. On closer approach the aeroplane crew thought they might be fish crates, washed from a trawler. Visibility was very bad, and to make sure the officer in charge of the aircraft lost height and circled the objects. Using binoculars, the



(Left) A German photograph taken after the bombing of Cracow aerodrome in Poland. The white blobs are bomb craters and it is stated in the German caption that the picture shows how the instructions of the Fuhrer were observed, i.e. not a single bomb hit buildings and fields adjoining the aerodrome. The key is: 1, hangars; 2, workshops; 3, engine test beds; 4, garages; 5, hangars completely destroyed; 5a, control room; 6, shelters; 7, munitions depot; 8-8a, riding school and cavalry barracks; 9, aircraft in the open; 10, range; 11, old fortifications; 12, apparently storage sheds; 13, the churned-up aerodrome.

The two pictures on this page are claimed by Germany to have been taken since the beginning of the war. In the one above the Mersey Tunnel is shown dotted. The view on the right is of Manston. Other pictures show shadows which are curiously short considering the time of the year.

WAR IN THE AIR (CONTINUED)

navigator saw that there were two rafts tied together, with four men on one and three on the other. Wild seas were sweeping over the small rafts, and all that the aircraft, which was not a seaplane, could do was to search for a ship to come to the rescue. Ten miles away the Danish vessel *Ivar* was intercepted, and the wireless operator tried to communicate with her by lamp. For 10 minutes the aircraft flashed signals, but as the merchantman did not alter course the appeals for help were obviously not understood. The aircraft then went back to the rafts, but owing to the very heavy seas and thick mist could not locate them at first. The pilot began another systematic search and eventually the rafts were found. Almost at the same moment the wireless operator was able to attract the attention of the Norwegian ship *Lyng*. To indicate the exact position of the rafts, the crew of the aircraft fired coloured Very lights into the sea. By this time, however, the Danish ship *Ivar* was also coming to the scene, steaming fast. Its crew had apparently realised that its services were needed and had followed the direction taken by the aircraft when it left them. With rescue now possible by two ships, the aircraft flew a few feet above the rafts. It was seen that the men on them were in extreme exhaustion, but each man was able to raise an arm and wave. When the *Ivar* was 800 yards off the men on one of the rafts fired what seemed to be their last distress signal. So terrible was the weather that even at this distance the signal could not be seen by the merchant vessel. It seemed to the R.A.F. men that the ship would miss the derelict sailors. The pilot, therefore, flew across the bows of the *Ivar* and took her to the spot yard by yard. When the ship had been guided to a short distance from the rafts a small boat was lowered in the violent sea. After it was seen that all seven men were safe and the lifeboat had been hoisted on board the *Ivar*, the Coastal Command aircraft made a final fly past and headed for its base. The *Lyng*, seeing that she was no longer required, continued on her way.

On Friday, December 8, enemy aircraft were reported off the East Coast during the night. R.A.F. Fighter aircraft were sent up to intercept them. One enemy aircraft approached the Thames Estuary and was driven off by anti-aircraft fire. The Germans announced that one of their reconnaissance aircraft reached London on Thursday, but there is no truth in the statement.

A suggestion has been made in German newspapers that during the Royal Air Force raid on Borkum on November 29 the British aircraft infringed international law by machine-gunning unarmed merchant vessels. This suggestion, the Air Ministry announces, is entirely false. The attack was, in fact, confined to five seaplanes on the slipways, the machine-gun posts on the roof of the hangar and to coastal defence vessels which had opened fire on our aircraft.

Aircraft in Finland

THE Finns are putting up a most gallant fight against the Russian invaders of their country. A report, not confirmed, says that two parties of Russian parachutists landed in Finland, one in the North, and the other near Viborg, but were both speedily rounded up by Finnish soldiers. If there is any truth in this story it is the second use of parachute troops in war, the first having been by Germans in the Polish campaign. The Germans, however, were not in uniform, and so were executed by the Poles when they were caught. Military authorities in this country do not believe that there is any important future before parachute troops.

The Finnish air corps is certainly behaving with splendid vigour. Their fighters are credited with having shot down twenty-four Russian machines in two days, and their bombers made a surprise attack on the Russian air base at Murmansk, in the Arctic Circle, and believed that they destroyed as many as sixty Russian machines by means of small incendiary bombs. The Russians deny that this raid took place. They are also said to have bombed an air base at Paldiski, the port which has been compulsorily leased by Estonia to the Soviet.

The Finns have ordered a number of British aircraft—one hundred Spitfires have been mentioned, as well as other machines—and it is understood that some have been urgently despatched. The Italians, who are full of indignation at Russia's unprovoked attack on Finland, have also sent eighty aircraft to Finland, and there is a suggestion that the Italian airmen who fought in Spain may go in a body to help the Finns. Unfortunately, it seems unlikely that any number of aeroplanes would be able to drive back the vast invading forces of the U.S.S.R. An adequate supply of fighters might, however, do a great deal to check the barbarous bombing of Helsinki and other Finnish towns which has been going on. One report says that already the Finns have been using Blenheims as fighters to drive off ground-strafing Russian machines.

The Fight of Nov. 6.

THE following thrilling story is taken from a letter written to his brother by a young pilot of *l'Escadrille des Sioux* which, with *l'Escadrille des Canards*, took part in the famous combat of November 6. Published originally by *L'Echo d'Oran*, it is taken from our French contemporary, *Les Ailes*.

"The combat occurred on Monday, November 6, between 3 and 3.30 p.m., with nine Curtiss against twenty-seven Messerschmitt single-seat fighters.

"Not one of ours was brought down or wounded, and we brought down nine Germans. I accounted for two; the first after five minutes of combat between 18,000ft. and the ground. The pilot took to his parachute at about 350ft. and was taken prisoner just behind the Maginot Line. I climbed quickly to the fight to take another one from it with me. After the first burst, he dives to death, emitting smoke, but that does not take me in! It is a trick to make one believe they are in flames so as to escape easily. Like the other, I did not cease spraying him with my four machine guns and before he had crossed the Saar I was able to put an incendiary bullet into his petrol tank. It exploded and he went down in flames into a pine forest. Twenty minutes of fighting had passed.

"For the third time I climbed but found only two of my comrades. The Germans, more or less crippled, had decamped.

"What joy to find ourselves all complete that evening! Only three machines had been lightly struck by bullets and only one had been forced to land—on its stomach with wheels up, but without ill effect. Mine had not even been scratched. One can say that this combat was a miracle.

"Of the nine machines, six were 'Sioux' and three were 'Canards.'

"What is most terrible is to keep the enemy in sight at all costs, while one is crushed down on one's seat by "g," and to look behind so that one is not shot in the back and at the same time look ahead for any enemy who is not on his guard. One sees grey, one sees red, one sees black. One has the impression that one's head has split, that one's eyes are turned in their sockets, but one sees just the same. One flies, one looks out, one shoots, one defends oneself all at once; one loses 16,000ft. in a few seconds and regains it in nearly as few.

"The next day, November 7, I forced down a twin-engined Dornier 17 with a crew of three in Germany. Just past Saarbrucken I set fire to his right motor and at Nord de Bitche, between the frontier and Pirmasens, I finally beat him, probably wounding the pilot, because he made a sudden lunge forward and then fell back. He crashed to the ground and burnt. Immediately the German anti-aircraft guns opened fire on me and I do not know how I got through the wreaths of smoke without getting at least one shell burst.

"Short of petrol, I put down at ———— to refuel before going home."

EXHAUST EFFLUX PROPULSION—IV

Concluding Instalment of This Series of Articles

By F. W. LANCHESTER, LL.D., F.R.S.

(*Continued from page 460, Dec. 7, 1939*)

WE now enter into an entirely new phase of the discussion. So far the whole charge has been treated as though it originally formed part of the aeroplane; that is the aeroplane was supposed to lose weight (mass) to the extent of providing for the mass of the efflux gases. Strictly speaking it is only legitimate to make use of the equation of the rocket [eq. (4)], on this understanding. Actually the only part of the charge complying with this condition is the *fuel*, representing about 1/15th of the total charge.

In order to regularise the position we need to take the induction system into account. In a high-speed aeroplane it is customary to "scoop up" the air by means of a rudimentary cowl of some kind, or by an aperture facing the direction of flight, and so to convert the velocity of relative motion into pressure to give a low degree of supercharge, the pressure available being that calculated on the Torricellian principle (otherwise *the principle of work*). Thus the "head" corresponding to any given velocity is given by the equation expressing the height through which a body must fall freely in order to acquire that velocity; the ordinary equation, $s = V^2/2g$ applies. Assuming V = 400ft./sec. –

$$s = \frac{160{,}000}{64.4} = 2{,}480\text{ft.}$$

In order to express this as pressure it must be multiplied by ρ = density; for air at normal temperature ρ = .076 (lb./cu. ft.). Hence pressure = 2,480 × .076 = 192 pounds per sq. foot = 1.33 pounds per sq. in. This is only just (about) sufficient to maintain atmospheric pressure during the induction stroke, nevertheless it ranks as supercharge. The flight resistance due to scooping up the air charge in this manner is best calculated from the energy represented, thus, energy per second = $\frac{.28 \times 400^2}{2}$ = 22,400 foot poundals, or = 700 ft.pounds per second. This is just 1 per cent. of the total h.p. Here the mass of air has been taken at the same figure as that calculated for the whole charge; the more exact figure would be 0.26lb. per second, giving 650 ft.pounds per second = .0093 of the total h.p., or 0.93 per cent.

Two Points of View

This may be regarded from two points of view; we may consider the induction system as something apart, by which the charge becomes or is made a part of the aeroplane, so that it may be subsequently treated on that basis by an application of rocket theory; in this case the loss due to the scooping up of air has to be set off against the gain at efflux, as adopted in the present articles. On this understanding the *gain* as calculated as due to efflux is subject to a deduction of approximately 1 per cent., thus:—

TABLE II

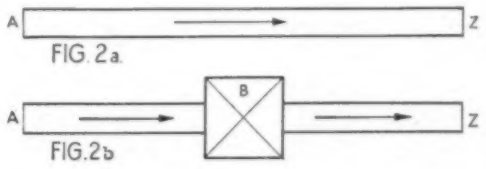
Basis (1) or (2)	Flight Speed V ft. per sec.	Gain as given without deduction per cent.	Gain subject to deduction per cent.
Condition (1)	400	6.30	5.30
	600	9.25	8.25
Condition (2)	400	1.0	None

In practice condition (1) could be closely approximated by the simple expedient of fitting a separate exhaust pipe to each cylinder; and preferably by the provision of exhaust ports adapted to be overrun by the pistons, as already described. Condition (2) could only be brought about by perversity on the part of the designer; *any* reasonable disposition of exhaust, provided that the discharge pipes are directed rearward, would result in *some* of the "tail" energy of the diagram being utilised, so that the practical result will always be a gain in some degree, the possible limits being suggested in the table above. There may be back pressure more or less during the return stroke, without regard to any question of auxiliary propulsion, but that is "all in the day's march," it is taken into account on the test bench as forming part of the difference between indicated and brake h.p., but this may be and sometimes is eliminated by the Atkinson method.

Not All Gain

It must not be thought that when the Atkinson method is used to relieve back pressure during the return stroke, without going to the length of scavenging, it is all to the good; when making use of the "tail" energy, condition (1), the energy expended in hastening the evacuation of the residuary gases (during the return stroke) must come from somewhere, and must perforce result in a reduction of the energy available in the efflux blast. In fine, it brings about a transference of a small proportion of the available energy from the auxiliary efflux system to the main propeller.

It has been stated above that, strictly speaking, such part of the charge alone which consists of *fuel* ranks for treatment on the rocket theory, as this is the only part of the mass constituting the charge that has its origin in the aeroplane and which, when ejected, leaves the aeroplane deprived of a part of its substance. This means



that the air and the fuel constituting the charge should be given separate consideration. However the *fuel* only accounts for some 6 per cent. or 8 per cent. of the whole charge, and the writer has not thought fit to make a point of it, it may be regarded as of negligible importance. It means that in Table II the word "None" should be replaced by the figure 0.05 per cent. or .0005 of the engine power; the day is very far distant when a difference of this magnitude will need to be considered.

There is an entirely different line of approach which the writer will now proceed to develop. In this the induction and exhaust instead of being considered separately are taken as a whole. We shall start with a simple tube, Fig. 2a, set with its axis parallel to the

line of flight. It requires no proof to show that, neglecting skin-friction, the energy of the efflux at Z is equal to that of influx at A. Now in Fig. 2b, let us introduce some kind of "bunker" B by which the air entering at A is brought to a state of rest before being allowed to pass out at Z; this bunker may be of any kind or description, a mere box, or a labyrinth, or an engine, anything in fact. Whatever resistance the air may experience in traversing this bunker is its own private affair, and so long as there is no volumetric change, and the inlet A and the outlet Z are of the same area, the inlet velocity will be the same as the outlet velocity and the kinetic energy of the ingress and the egress are equal to one another. Again, if there be a change of density, as is the case when the bunker is a heat engine, then so long as the areas at A and Z are so proportioned that the velocity at ingress is equal to that at egress, the same applies. Moreover, if the obstacle presented by the bunker or engine results in the accumulation of pressure, and, as must be the case with a compressible fluid (air), a storage of energy, this energy again becomes available in the kinetic form as the expanding air passes out through the discharge pipe B Z. This may be taken as a literal interpretation of condition (2) and it agrees with the entry in the table (under the heading Gain) "None." But when the engine makes a substantial addition to the energy of efflux, condition (1), this equality no longer holds and the discharge energy may be many times greater than the reception energy, this being the condition examined in the second article of the series.

It must not be overlooked that the function of the induction pressure as a means of effecting supercharge may be deemed justification for the loss due to the direct flight resistance involved, and if this view be accepted, there is no longer any need to treat it as a set-off against the gain given in Table II.

HERE and THERE

The Guggenheim Medal

Donald Douglas receives his award for work on transport aircraft.

THE Daniel Guggenheim Gold Medal for 1939 has been awarded to Donald Wills Douglas "for outstanding contributions to the design and construction of transport airplanes." Donald Douglas, as readers of *Flight* will know, is head of one of the largest privately owned aircraft factories in the world. At the present time the Douglas Aircraft Company employs, at Santa Monica, California, some 11,000 men, and it is expected that by June, 1940, the number will have increased to about 17,000. In 1935 he was awarded the Collier Trophy in recognition of his work on the development of twin-engined commercial aeroplanes, and the same year he read the Wilbur Wright Memorial Lecture to the Royal Aeronautical Society in London.

Previous recipients of the Guggenheim Medal are: 1929, Orville Wright; 1930, Dr. Prandtl of Göttingen; 1931, Dr. F. W. Lanchester; 1932, Senor de la Cierva; 1933, Dr. J. C. Hunsaker; 1934, William E. Boeing; 1935, Dr. William Durand; 1936, Dr. George W. Lewis; 1937, Dr. Hugo Eckener; 1938, Mr. A. H. R. Fedden.

The Guild in Wartime

EVEN in peaceful times the Guild of Air Pilots and Air Navigators had some difficulty in getting its members together, due to the inevitable scattering resulting from the nature of their work. The war has increasred these difficulties, but the Guild is carrying on, although its activities have necessarily had to be restricted. Many members of the Guild, including the Deputy Master and the General Secretary, have been called up for service.

To continue the good work of the G.A.P.A.N. a War Emergency Committee has been appointed by the Court. Capt. Lamplugh, Flt. Lts. Bulman Pike and Woodhead, and the Clerk, with the Deputy Master when he is available, will deal with current business and conserve the Guild's assets.

It has been decided to hold the tenth annual general meeting at the Royal Aero Club on Saturday, December 16, at 5 p.m. It is hoped that a sufficient number of members will be able to attend and give their views. One of the subjects to be discussed at the meeting is the suggestion that members who have suffered financially as a result of the war might be allowed to continue their membership by paying a minimum annual subscription of one guinea.

On the financial side the income has exceeded expenditure by £24 18s. 2d. The accumulated fund at the end of September amounted to £9,699 10s. 7d., having increased by £5,323 11s. 3d. during the year. The fund is represented by: Cash, £4,750 17s. 8d.; investments, £4,765 15s. 1d.; debtors, £188 5s. 4d.

Rolling Along

AMERICAN deliveries of aircraft to the Allies are rolling along in more ways than one. The American State Department ruled recently that aircraft purchased by belligerents may be flown to the Canadian frontier, there to be hauled or pushed over the border, so long as the manufacturer retains the title to the aircraft. What is now needed is to establish an aerodrome the southern end of which is in the United States and the northern end of which is in Canada. Then the American pilot can land and jump out, and the Canadian pilot hop in and take off for the Canadian port from which shipment to Europe is to be made. Perfectly simple, is not it?

And the best of it is that an offer of such an aerodrome has already been made. Mr. Alonzo Mather, a Chicago business man, is so darned neutral that he doesn't care who licks Germany, and he has offered his extensive property near Old Forterie, on the Niagara River, as an aerodrome. But stay, is Old Forterie on the Niagara on the border? You tell us.

Talking in Circles

THE Second Annual Rotating Wing Aircraft Meeting, convened by the Philadelphia Chapter of the Institute of the Aeronautical Sciences, was held at the Franklin Institute on November 30 and December 1 and 2. Some 200 scientists, pilots and leaders of the aircraft industry attended the meeting. On the first day papers were read by Lt. E. S. Nichols, U.S. Army Air Corps ("Army Experiences with Rotary Aircraft"), Mr. Arthur M. Young ("A New Parameter of Lifting Rotors,"), Mr. John M. Schuckers ("Rotor-craft Drive Systems"), and Capt. John M. Miller ("Roof Landing Problems"). In the evening Mr. Igor Sikorsky lectured on "Commercial and Military Uses of Rotating Wing Aircraft."

On December 1 no fewer than nine papers were read, five in the morning and four in the afternoon. The papers and their authors were: "Economic Significance to Passenger Traffic of Central-City Landings," C. E. McCollum (TWA); "Mechanical Design in Rotary Aircraft," J. S. Pecker (Machine and Tool Designing Co.); "Gyroplanes and Combination Types," E. Burke Wilford (Penna. Aircraft Syndicate); "Treatment of Performance Losses on Rotors with Centre Cut-outs," Paul H. Stanley (Pitcairn); "Stress Analysis of Rotor Blades," Hugh Mulvey (Kellett); "Photographic Observations in Flight of the Stalling of Rotating Wings," F. J. Bailey, Junr. (N.A.C.A.); "Rotor Controls," Harris S. Campbell; "Rotor Vibration Problems," R. H. Prewitt and R. A. Wagner (Kellett); "Stability in Rotary Aircraft," Alexander Klemin (N.Y. University) and Lt. Victor Haugen (U.S. Army Air Corps).

The morning of the third day of the meeting was devoted to demonstrations of take-offs and landings, the "aerodrome" being the roof of the Philadelphia Post Office.

SERVICE AVIATION

Royal Air Force and Official Announcements

269 Squadron's Birthday

No. 269 Squadron, which was re-formed at Bircham Newton, Norfolk, on December 7, 1936, last Thursday celebrated the third birthday of its second period of existence. The squadron, which belongs to the Coastal Command, has a fine record since the outbreak of war. It has already flown 3,000 hours over the sea in all weathers, including a considerable amount of night flying. Its aircraft have travelled at least 450,000 miles—an average of 6,700 miles daily, since the start of hostilities. The squadron has brought in detailed reports, for safety and contraband purposes, on 680 merchant vessels. It has also sighted seven enemy submarines, five of which were attacked unaided by its aircraft.

Radio for R.A.F.

PORTABLE radio sets form a large percentage of the requests from units to the R.A.F. Comforts Fund. A well-known firm of radio manufacturers have offered 1,000 sets at less than cost price, and the Comforts Fund is anxious to raise the £5,000 quickly to take advantage of this offer. Donations, which will be acknowledged, should be sent to the Officer-in-Charge, R.A.F. Comforts, Berkeley Square House, Berkeley Square, London, W.1.

Membership of London Clubs

CERTAIN London clubs offering honorary membership to officers of H.M. Forces require them to sign their names in a visitors' book on their first visit, but officers are now reminded not to state their units. To the list of clubs offering facilities are added the Connaught and Public Schools' clubs.

Officers Pay

THE Air Ministry have announced that any officers or airmen who have not yet received pay due to them should write to:

The Air Ministry (P.2),
Adastral House,
Kingsway,
London, W.C.2.

It is emphasised that each case brought to the notice of this department will receive immediate attention.

First Jamaican for R.A.F.

GUY BACQUIE, of Kingston, Jamaica, celebrated his 25th birthday last week by arriving in London to join the R.A.F. He is the first Jamaican to be accepted.

A Canadian Squadron—

EVERY province in the Dominion of Canada is represented in the first all-Canadian squadron—a fighter unit—of the R.A.F. The Squadron Leader is a member of the Royal Canadian Air Force who lately came to England for two years' experience with the R.A.F.

It is said that the squadron has only one difficulty still to solve—that of choosing its unit badge. It would have liked to use the maple leaf but this has long since been appropriated by No. 5 Squadron to commemorate its close association with the Canadian Corps in 1918-1919.

—And an Australian

BEFORE the war the Commonwealth Government placed an order with Short Brothers for a batch of Sunderland flying boats. Most of these aircraft have been delivered and are stationed at a base in the United Kingdom. They are manned by personnel of the Royal Australian Air Force who had been sent to the United Kingdom for the purpose of flying them to Australia. When war broke out, the Commonwealth Government promptly placed these aircraft and their crews at the disposal of the United Kingdom Government.

The remaining aircraft are now being delivered, and additional Australian personnel will shortly be arriving in this country to man them. The intention of the Commonwealth Government is that a full Royal Australian Air Force squadron shall then be formed for immediate reconnaissance duties in co-operation with the Royal Air Force.

The complete squadron will be ready for active service with Coastal Command early in the New Year. In the meantime the Royal Australian Air Force officers and men are fully employed in advance training.

"Flight" photograph.

NAVIGATIONAL: Surrounded by geodesics and complicated gadgetry, the navigator of a Vickers Wellington long-range bomber sets about his business.

New Zealand Too

BEFORE the war a mobile flight consisting of a number of officers and airmen of the Royal New Zealand Air Force was forming in the United Kingdom to take over some of the Wellington bombers which the New Zealand Government had ordered, and to fly these aircraft to New Zealand. Immediately war was declared, the Government of New Zealand readily placed these officers and airmen, together with the Wellingtons, at the disposal of the United Kingdom Government.

The question of forming a New Zealand Squadron in the Royal Air Force is now being considered.

The National Pigeon Service

HIS MAJESTY THE KING has accepted the badge of the National Pigeon Service, which was recently established under the direction of the Air Ministry to enable the defence Services to make full use of the homing pigeon as a means of communication in peace and war. The badge, to which all members of the National Pigeon Service are entitled, is enamelled in blue and surmounted by a gilt crown. It shows a pigeon at rest and bears the inscription "National Pigeon Service." His Majesty takes a keen interest in the work of the Service and from the Royal loft at Sandringham the King's birds are daily sent out on war service. Important messages have already been received by their aid. A short while ago a British pilot flying off the coast found himself running short of petrol. He released one of his pigeons which flew to the Royal loft at Sandringham with a message. This was duly telephoned to the pilot's base, where arrangements were made at once to go to his assistance. The pilot managed to reach his aerodrome, but if, as had seemed likely, he had come down in the sea, the pigeon might well have saved his life and the aircraft as well.

Service Aviation

ARISTOCRATIC : The Bristol Beaufort I high-speed multi-purpose monoplane showing how small is the frontal area of each of its two Bristol Taurus sleeve-valve radials.

The King has asked that a fortnightly report on the activities of his birds should be submitted to him.

Each member of the National Pigeon Service contracts to loan his birds for war work. The scheme is purely voluntary, but a grant of £5 a year is made by the Air Ministry to all fanciers in cases where ten or more of their birds are actually employed. There are already some 15,000 members, and the number of pigeons available for active service is approximately 750,000. More members are required, and pigeon fanciers who are interested in this scheme should communicate with Mr. J. Selby Thomas, 22, Clarence Street, Gloucester, who is the Secretary of the National Pigeon Service Committee.

Casualties

THE Air Ministry regrets to announce the following casualties on various dates:—

KILLED IN ACTION.—P/O. R. J. Melville-Townsend, A/C.1 H. Taylor, Sgt. R. Walsh, A/C.1 A. U. Smith, Sgt. C. Thomas.

PREVIOUSLY REPORTED "MISSING," NOW REPORTED "KILLED IN ACTION."—Sgt. O. L. D. Howells, F/O. H. B. Lightoller, A/C.2 F. G. Moller, P/O. W. J. Murphy, L.A/C. J. Quilter, A/C.1 F. J. Soffe, Sgt P. E. B. Sproston, Sgt. A. O. Heslop, A/C.1 E. W. Lyon, Sgt. G. W. Marwood, Sgt. L. R. Ward, A.Sgt. C. G. Williams.

PREVIOUSLY REPORTED "MISSING, BELIEVED KILLED," NOW REPORTED "KILLED IN ACTION."—Sgt. R. S. Potts.

MISSING.—A/C.2 D. W. Barker, A.Flt. Lt. R. E. Mills, Sgt. K. B. Crew, Flt. Lt. A. A. Dilnot, Sgt. T. E. Page, Sgt. G. Storr, Sgt G. H. B. Taylor, A/C.1 J. A. Topham, A/C.1 C. Wilson.

MISSING, BELIEVED KILLED.—P/O. J. W. C. Robertson, P/O. H. J. Keller.

DIED ON ACTIVE SERVICE.—A/C.1 P. G. Holmes, L.A./C. A. C. E. Pears, A/C.1 C. W. Wagner.

PREVIOUSLY REPORTED "MISSING," NOW REPORTED "PRISONER OF WAR."—Sgt. S. McIntyre.

KILLED ON ACTIVE SERVICE.—A.P/O. S. G. Baker, Sgt. P. J. W. Barwick, P/O. J. C. Campbell, P/O. D. C. R. Carter, F/O. J. F. Chandler, Sqn. Ldr. C. C. Clark, P/O. H. K. A. Drummond, A.P/O. R. Dunham-Treble, Sgt. J. B. Golden, A/C.2 A. Hardman, P/O. O. C. Hume, P/O. K. C. H. Jacobs, Sgt. K. J. Linton, Cpl. F. J. W. Moores, P/O. J. Musgrave, Sgt. J. W. R. Parr, A/C.2 I. R. W. Partlow, A/C.1 V. W. L. Richardson, A/C.2 F. Shepherd, L.A/C. R. A. Stirling, Sgt. G. R. C. Talbot, A/C.1 A. Wade, Sqn. Ldr. P McG. Watt, F/O. P. C. Wheeler, P/O. R. M. Williams, Sgt. R. W. Adcock, P/O. G. F. A. Barwell, Sgt. R. S. W. Cordle, P/O. E. E. Crompton, Sgt. S. J. Farmer, F/O. D. R. D. Green, Flt. Lt. W. I. Hammond, A.Sgt. R. L. Harrison, P/O. J. M. Hinds, Flt. Lt. E. H. Jago, P/O. K. G. Lamb, A.Flt. Lt. K. Maconochie, A/C.1 A. Matthews, Sgt. R. Mitchell, A.P/O. S. B. Morris, A/C.2 G. H. C. Newman, A.P/O. W. R. Ross, Sgt. A. V. Strong, Sgt. E. T. Summers, A.Sgt. V. B. Thorne, P/O. R. Thynne, F/O. A. A. Vickers.

DIED ON ACTIVE SERVICE.—Sgt. J. W. Allen, A/C.2 E. V. Eades, A/C.1 E. J. Emery, Cpl. A. McD. Henderson, L.A/C. G. T. Landing, A/C.2 R. G. Lees, A/C.2 R. W. Lloyd, A/C.2 A. McCleery, A/C.2 G. F. Reeve, A/C.2 Y. Rockingham, A/C.2 S. C. S. Rolfe, A/C.1 S. Taylor.

Royal Air Force Gazette

Royal Air Force

General Duties Branch.

D. F. Braham is granted a permanent commission as Pilot Officer with effect from Oct. 7 and with seniority of Jan. 7, 1938 (substituted for notification in *Gazette* of Oct. 20); T. F. Gill is granted a short service commission as Pilot Officer for five years on the active list with effect from Aug. 16 and with seniority of June 22 (substituted for notification in *Gazette* of Aug. 29); Pilot Officer on probation F. E. G. Rashleigh is confirmed in his appointment (Oct. 27); Acting Pilot Officer on probation C. S. Robinson is confirmed in his appointment and graded as Pilot Officer (Nov. 6).

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—(Nov. 5) P. R. Godby, E. L. Baudoux; (Nov. 6) D. W. Holford, R. E. Packington, G. Massey-Sharpe, F. G. Axtell, F. B. Bassett, N. G. Bowen, J. A. Clark, A. M. Dillon, P. D. Furniss, D. R. Griffiths, B. H. Herrick, D. H. S. Kay, W. J. R. Kirk, J. B. Latta, A. MacLeod, J. F. J. Macphail, F. Riley, R. W. Stokes, S. R. Thomas, H. G. Tipple, L. J. B. Truscott, T. D. Welsh, E. H. Whitehouse, D. Whitley, P. A. Willatt, M. H. Young, R. W. Ayres, E. G. Bidgood, M. A. Bussey, H. P. Clark, W. R. Corkhill, J. M. Derbyshire, R. H. Edwards, W. H. G. Gordon, N. P. W. Hancock, A. R. H. Hayter, G. E. Hill, J. R. Hyde, D. F. Jones, M. M. Lambert, M. C. A. Linden, B. M. McDonough, K. B. McGlashan, K. I. Mackenzie, R. I. C. Macpherson, D. G. Macqueen, G. A. Madore, E. D. Pennington, J. F. H. Peters, R. H. Rigby, G. M. Robinson, P. G. Royle, R. M. Russell, H. C. Sheldon, J. B. Smiley, D. A. Todd, R. M. Trousdale, V. B. Verity, R. M. Walker, W. J. Warren, R. J. Whight, R. H. Wiens, J. L. Wilkie, W. S. Williams.

F/O. S. Lugg is promoted to the rank of Flight Lieutenant (Nov. 21).

The following Pilot Officers are promoted to the rank of Flying Officers:—(Nov. 30) J. F. Sharp, M. E. Redgrave, B. G. Meyer, D. B. Gericke, L. J. Rooney, R. K. Beale.

F/O. J. H. Giles is granted the acting rank of Flight Lieutenant (Sept. 1); P/O. G. L. R. J. Ansell takes rank and precedence as if his appointment as Pilot Officer bore date Oct. 31 (reduction to take effect from Oct. 31); Wing Cdr. B. A. Maier is placed on the retired list on account of ill-health (Dec. 2); F/O. R. H. Lonsdale resigns his short service commission (Nov. 30); P/O. G. Tanner relinquishes his short service commission on account of ill-health (Oct. 31); the short service commission of Acting Pilot Officer on probation A. C. O'Hara is terminated on cessation of duty (Dec. 1).

Equipment Branch.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—(Sept. 6) W. J. Nightingale, P. Cartridge, H. G. Belcher, R. Lee, B. McA. Hodge, N. V. Carter, C. S. Reade, G. D. Dillabough, O. E. Bartlett, J. S. Miller; (Sept. 7) W. C. Trevitt; (Sept. 8) B. P. Fortescue, H. G. Cadwallader, A. E. Arnott, C. W. Laing; (Sept. 14) E. J. G. Symonds, P. Prince; (Sept. 15) B. H. Lawrence, P. C. Barlow; (Sept. 26) R. G. Reid, A. L. Prince, J. P. Conway; (Sept. 27) P. A. Mason; (Sept. 29) F. J. Ford, R. M. Hall, A. M. Roberts; (Oct. 3) A. Yates; (Oct. 12) J. W. Mackay; (Oct. 13) D. S. Sanderson; (Oct. 14) R. C. Hodgson, C. J. T. Giddings, D. E. Allsopp, F. F. Baker, F. N. Baird, J. H. Granville Brown, R. J. Tilley, J. C. Chamberlain, W. M. Dallas; (Oct. 15) R. O. Snape; (Oct. 17) A. C. Bartrum, G. W. Stoddard, T. J. da C. Andrade, I. H. Matheson, T. J. Goggin, A. A. G. Goodall; (Oct. 19) D. C. A. Howden, R. H. Aird, W. A. W. Reid; (Oct. 22) M. C. Hart; (Oct. 23) C. H. Edwards; (Oct. 25) P. J. Finn, C. M. Gilbert, P. Weaver; (Oct. 31) P. G. Tyler, D. K. Petty, C. S. Hatfield; (Nov. 9) L. F. St. J. Pigott.

Pilot Officer on probation D. K. Morgan is confirmed in his appointment and promoted to the rank of Flying Officer (Sept. 12).

The following Pilot Officers are promoted to the rank of Flying Officer:—(Oct. 31) R. J. T. Beattie, J. C. Chadwick, D. A. M. Hopkins, J. A. Hunter, W. J. G. Murphy, K. A. Phillips, K. J. Wood.

Commissioned Engineer Officer.

F/O. S. W. Blight is promoted to the rank of Flight Lieutenant with effect from Nov. 18 and with seniority of Oct. 26.

Commissioned Signals Officer.

F/O. T. Wilson is promoted to the rank of Flight Lieutenant with effect from Nov. 4 and with seniority of Oct. 26.

Princess Mary's Royal Air Force Nursing Service

The following Staff Nurses are confirmed in their appointments on the dates stated:—(Nov. 1) Miss E. J. F. Bray; (Nov. 8) Miss E. C. Cross; (Nov. 15) Miss B. M. Morgan.

The following Staff Nurses are promoted to the rank of Sister:—(Nov. 29) Miss E. M. Mason, Miss M. Wilson.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

Maj. R. O. Skinner is granted a commission in class CC as Squadron Leader (April 17); Maj. A. P. Faris (R.A.R.O.) is granted a commission in class CC as Squadron Leader from May 17 to Nov. 4 inclusive; Lt. J. C. Clough is granted a commission in class CC as Flight Lieutenant (June 19); Flt. Lt. A. G. D. Alderson is granted the rank of Squadron Leader (July 24).

The following relinquish their commissions in class CC on appointment to commissions in the Royal Air Force Volunteer Reserve (Sept. 1):—Sqn. Ldrs. (Acting Wing Cdrs.): K. D. F. McCaskill, O.B.E., E. S. C. Grune, J. M. Brickman. Flt. Lts.: G. Milner, W. Coker, D.F.C., J. C. Walker, H. C. Todd (R.A.F.O.). Flying Officers (Acting Flt. Lts.): E. C. Durbin (R.A.F.O.), M. J. Wyatt, M.C. (R.A.F.O.), H. de M. Middleton (R.A.F.O.). Flying Officer (Hon. Flt. Lt.): J. S. Curtis. Flying Officer: F. W. Marshall (R.A.F.O.).

F/O. R. M. H. Noble relinquishes his commission on appointment to a commission in the Legal Branch of the Royal Air Force Volunteer Reserve (Nov. 3).

Administrative and Special Duties Branch.

E. Addis is granted a commission as Flying Officer with effect from Oct. 17 and with seny. of May 17, 1936. (Substituted for notification in *Gazette* of Oct. 27.)

Equipment Branch.

The following Flight Lieutenants relinquish their commissions in class CC on appointment to commissions in the Royal Air Force Volunteer Reserve (Sept. 1):—A. H. Brain, W. B. J. Humphrey.

Medical Branch.

R. S. Maclatchy, M.R.C.S., L.R.C.P., is granted a commission as Flying Officer in class D with effect from Nov. 27 and with seny. of Nov. 27, 1933.

Royal Air Force Volunteer Reserve

General Duties Branch.

The following are granted commissions for the duration of hostilities as Pilot Officers on probation on the dates stated:—(Nov. 13) E. Maxwell-Lipkin; (Nov. 18) W. Towers-Perkins; (Nov. 23) W. C. Potter.

Capt. G. P. Y. Mascall (R.M., Ret.) is granted the honorary rank of Flight Lieutenant from Sept. 1 to Oct. 28 inclusive; Flt. Lt. C. R. Hemans relinquishes his honorary commission on cessation of duty (Nov. 26).

Administrative and Special Duties Branch.

The following are granted commissions in the ranks stated with effect from Sept. 1, and with seny. of the dates stated:—Squadrons Leaders: (April 17) Lt. Col. J. M. Brickman (I.A., Ret.); (April 26) Lt. Col. E. S. C. Grune; (July 31) Lt. Col. K. D. F. McCaskill, O.B.E. (R.I.A.S.C., Ret.). Flight Lieutenants: (June 6, 1934) Lt. Cdr. H. W. Avery Fox (R.N., Ret.); (Sept. 30, 1935) F/O. E. W. T. Crouch (R.A.F., Ret.); (April 1, 1936) F/O. E. C. Durbin (R.A.F.O.); (June 1, 1937) F/O. M. J. Wyatt, M.C. (R.A.F.O.); (Aug. 23, 1937) W. B. J. Humphrey; (Feb. 6) G. Milner; (June 5) F/O. H. de M. Middleton (R.A.F.O.); (Sept. 1) Capt. W. Coker, D.F.C., Capt. J. S. Curtis, F/O. F. W. Marshall (R.A.F.O.), F/O. J. C. Walker, Flt. Lt. H. C. Todd (R.A.F.O.), Flt. Lt. F. W. Clarke (R.A.F.O.), Maj. L. Findlater, M.C.

Capt. J. D. Gabb (I.A. Ret.) is granted a commission as Flight Lieutenant (Sept. 10); Lt. E. H. Hereford is granted a commission as Flight Lieutenant with effect from Sept. 1 and with seny. of July 10. (Substituted for notification in *Gazette* of Oct. 20.)

The following are granted commissions for the duration of hostilities as Pilot Officers on probation on the dates stated:—(Sept. 26) F. R. R. Kaye; (Oct. 14) K. P. Atkinson; (Oct. 20) J. C. Allan; (Oct. 25) G. H. L. Easterbrook; (Nov. 6) L. G. Birch; (Nov. 7) J. J. Boyd-Harvey; (Nov. 8) G. C. H. Culley, A. C. H. Maclean, C.B.E., D. H. G. Richardson; (Nov. 9) P. R. Alsing, T. L. Lewis; (Nov. 10) A. M. Anderson, P. M. Brooke, F. J. De Ramer; (Nov. 11) P. R. S. Gibson, M. A. Newnham; (Nov. 13) C. H. Grey, D.S.O., W. Morgan-Smith, E. J. Stedman; (Nov. 14) H. E. Faulkner, C. A. Hopkins, H. G. Kirk, W. D. L. Rayner, M.B.E.; (Nov. 15) P. C. R. Dodd, D.S.O., M.V.O.; (Nov. 20) H. J. Knevitt, C. L. Leven.

The following are granted commissions for the duration of hostilities as Acting Pilot Officers on probation on the dates stated:—(Sept. 5) J. H. King; (Sept. 12) R. A. Cotterell; (Sept. 18) H. W. Lester; (Oct. 6) G. P. Dealtry; (Nov. 23) H. G. Lewis.

R. Wilson is granted an honorary commission in the rank of Flying Officer (Nov. 28); S. S. Booth-Russell is granted an honorary commission in the rank of Pilot Officer (Nov. 28).

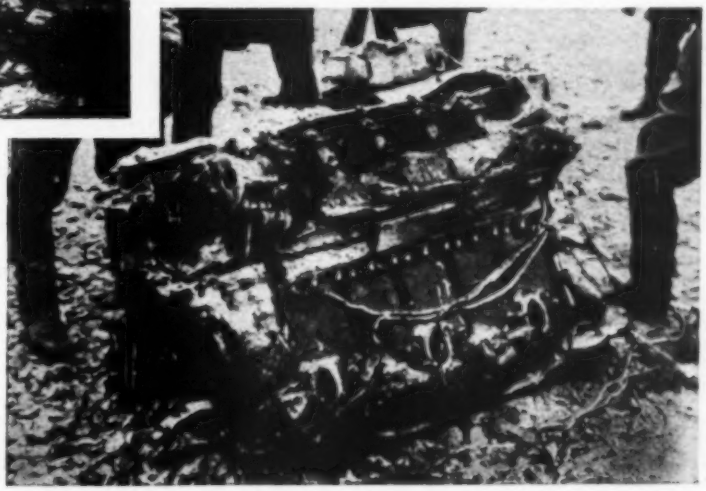
The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer on the dates stated:—(April 30) L. E. Barry; (May 6) V. F. S. Dunton; (Aug. 6) G. D. Hamilton; (Aug. 19) R. J. Bowen.

(Aug. 31) E. I. David, J. R. Pattison; (Sept. 1) A. Blomfield, W. F. Foulston; (Sept. 2) J. Molyneux; (Sept. 7) A. G. Abel, J. S. Bamford, S. W. Beese, A. G. Boycott, L. K. Bradley, A. H. Brown, T. R. Brown, F. Butler, S. A. Campbell, W. A. Carmichael, J. B. H. Carter, K. G. Chapman, C. V. G. Coleman, R. H. Collins, J. Coupland, S. Crann, J. A. C. Critchley, A. H. Emanuel, A. J. Fisher, M. Griffiths, T. H. Hooper, F. L. Hulbert, M. R. Landau, P. H. Legg, M. G. Lloyd-Jones, W. T. Matthews, L. E. Newnham, C. McC. Officer, H. R. P. Patterson, J. W. Perry, W. R. J. Phillips, C. St. Q. Playford, R. A. Pomeroy, G. M. Pryde, R. J. Rackham, E. Rateliff, G. Roberts, G. R. Sharp, R. P. Sleeman, K. C. Smith, W. C. Vaughan, R. H. Vincent, V. G. Walker, W. S. C. Watkins, T. Willcox, E. G. R. Wingham, H. Woffenden; (Sept. 8) H. G. Augur, D. O. Bishop, P. A. Bosanquet, D. R. W. Bowman, C. Ewens, J. I. Fell, R. T. Griffiths, C. N. Heath, T. G. G. Hutchinson, B. P. Jones, H. H. McLachlan, J. B. McMillan, A. Owen, A. J. Paterson, F. J. M. Pryer, J. S. Rowlands, D. L. Rundle, K. L. Scott, B. A. Smith, E. V. Stokes, A. C. Vivian, E. L. West, C. White, L. Worswick; (Sept. 9) G. L. Cropley, H. Ogden; (Sept. 10) L. F. Heald, A. C. Kermode; (Sept. 11) A. Leigh R. C. Turner; (Sept. 13) H. E. Bracey, A. Burton, R. McD. Meek, J. E. Scholey; (Oct. 15) L. J. Empson.

F/O. C. Osenton relinquishes his commission on account of ill-health (Nov. 28).

RUSSIAN REMAINS: Above is the tail of a Russian bomber—apparently an S.B.—brought down by the Finns not far from Helsinki. This type was used to a considerable extent in Spain and is based on an American Martin design. It carries a crew of three and does about 210 m.p.h.

On the right is a liquid-cooled engine of uncertain type, but apparently neither a B.M.W. VI nor an Hispano Suiza 12Y, both of which units are used in the Russian Air Force.



The personal numbers of the following are as now stated and not as in the *Gazette* of Oct. 31:—Flt. Lt. G. J. S. Lightbody (75372), Capt. P. S. Hargreaves (75373), Sec. Lt. S. Gilchrist (75374), Lt. F. H. S. David (75375), Lt. W. O. Whittick (75376).

Equipment Branch.

Flt. Lt. J. P. Hinks (R.A.F., Ret.) is granted a commission as Flight Lieutenant with effect from Sept. 1, and with seniority of Oct. 8, 1935.

The following are granted commissions as Flight Lieutenants:—(Sept. 1) Capt. D. Mackintosh, D.C.M., Capt. W. J. Marshall, Maj. A. H. Brain.

The following are granted commissions for the duration of hostilities as Acting Pilot Officers on probation on the dates stated:—(Sept. 29) T. C. Noble; (Nov. 13) A. F. J. Copson, G. P. Debono; (Nov. 20) V. H. Quinn; (Nov. 21) J. C. Allan, W. E. S. Archdale, D. C. Barrett, J. M. Barrett, G. M. Beer, T. A. C. Bell, N. H. Bennett, M. L. Block, C. F. Burgess, R. E. Butcher, R. H. Cain, H. W. A. Clifford, E. L. Cowan, I. C. Coward, A. R. Crew, J. E. Doran-Webb, D. I. Farquharson, L. S. N. B. Faulkner, E. J. W. S. Foote, J. C. Forbes, E. D. Gosschalk, R. Grace, V. A. H. Hamel-Smith, R. B. Harrison, H. M. Heywood, C. E. M. Hodding, W. G. Holmes, C. W. J. A. Homan, T. W. Howells, W. D. Hutchings, H. R. Johns, P. A. McEachern, I. F. McNicoll, K. A. Madin, A. W. Massey, A. P. Moore, H. Morris, T. B. Morgate, A. L. E. Ormond, D. H. Papps, J. McL. Paterson, F. W. Penn, the Hon. B. S. B. Plunket, E. C. Pointer, C. R. Pottinger, J. W. Price, H. E. Richardson, R. P. R. Sangster, C. S. Simkins, W. M. Skeffington, R. H. Summers, P. T. Sutton, G. B. Thomas, R. G. Thorby, D. H. Upcott, J. D. Watford, M. N. J. Wombwell, D. K. Wroe.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—(Oct. 14) J. L. Bush; (Nov. 9) L. F. Collins, W. J. F. Fenton, P. A. L. Cooper, D. A. Collins, J. M. Warner, J. H. G. Wilson, R. H. Warr, B. H. Allin, R. H. Knight; (Nov. 10) A. P. Woodyatt; (Nov. 17) D. R. Vickers; (Nov. 19) W. G. Welch, D. P. J. Bernard, P. J. Bleeck, B. A. W. Baird, F. J. P. Haynes, F. J. W. Knowles, A. L. Mitchell, J. W. Rotherham, E. A. Bradly, T. W. James, J. B. Stone, D. W. Charles, A. J. Cunningham, A. S. Duff, P. E. Willson, B. E. Goodwin, J. B. Jeyes, J. R. Armstrong, T. H. McCarthy, J. H. T. Fletcher, W. R. Gibbs, C. A. W. Carter, C. H. Watson, L. H. Winter, A. D. Rutherford-Jones, A. A. Solly, C. B. Lockerbie, J. F. Sexton, J. W. Lovell, H. G. Scott, L. A. Taylor, H. M. Bongard, K. E. Hollom, B. H. Edwards, A. R. Blunsdon, R. Bradshaw, W. L. B. Cochrane.

Accountant Branch.

Capt. C. Hammond, M.B.E. (I.A., Ret.), is granted a commission as Flight Lieutenant (Sept. 1).

Medical Branch.

D. D. MacDonald, M.B., Ch.B., is granted a commission as Flying Officer (Sept. 22). (Substituted for notification in *Gazette* of Oct. 20.)

The following are granted commissions for the duration of hostilities as Flying Officers on the dates stated:—(Nov. 7) M. Pearson, M.R.C.S., L.R.C.P., L.D.S.; (Nov. 15) J. S. Davies, M.D., C.M.

Dental Branch.

The following are granted commissions for the duration of hostilities as Flying Officers (Nov. 14):—G. C. Baird, L.D.S., E. T. Mason, L.D.S., C. L. Stevens, L.D.S., J. L. Trainer, L.R.C.P. and S., L.R.F.P.S., L.D.S., J. E. Tudor, L.D.S.

Legal Branch.

R. M. H. Noble is granted a commission for the duration of hostilities as Flight Lieutenant, with effect from Nov. 3 and with seny. of Aug. 26.

Meteorological Branch.

G. T. Smith is granted a commission for the duration of hostilities as Flight Lieutenant (Nov. 28).

Errata.

In the *Gazette* of Nov. 7 for Lt. J. Aylward *read* Capt. J. Aylward; *for* Capt. D. Fitzgerald Fitzgibbon *read* Capt. D. Fitz-Gerald Fitz-Gibbon, D.S.C.; *for* Capt. B. Lockner *read* Capt. C. B. Lochner, M.C.

Auxiliary Air Force

General Duties Branch.

No. 604 (COUNTY OF MIDDLESEX) SQUADRON.—P/O. H. Speke is promoted to the rank of Flying Officer (March 9).

No. 605 (COUNTY OF WARWICK) SQUADRON.—P/O. H. B. L. Hillcoat is promoted to the rank of Flying Officer (Sept. 11).

Equipment Branch.

The following Flight Lieutenants relinquish their commissions on appointment to commissions in the Royal Air Force Volunteer Reserve (Sept. 1).—D. Mackintosh, D.C.M., W. J. Marshall.

No. 909 (COUNTY OF ESSEX) SQUADRON.—P/O. A. C. McCarthy relinquishes his commission on account of medical unfitness (Dec. 1).

Medical Branch.

No. 902 (COUNTY OF LONDON) SQUADRON.—F/O. H. R. Smith, M.R.C.S., L.R.C.P., is promoted to the rank of Flight Lieutenant (Nov. 5).

No. 906 (COUNTY OF MIDDLESEX) SQUADRON.—F/O. B. Rothery, M.B., M.A., B.Chir., M.R.C.S., L.R.C.P., is promoted to the rank of Flight Lieutenant (Nov. 22).

No. 908 (COUNTY OF ESSEX) SQUADRON.—F/O. G. A. H. Norman, M.B., B.S., M.R.C.S., L.R.C.P., is promoted to the rank of Flight Lieutenant (Nov. 10).

The Industry

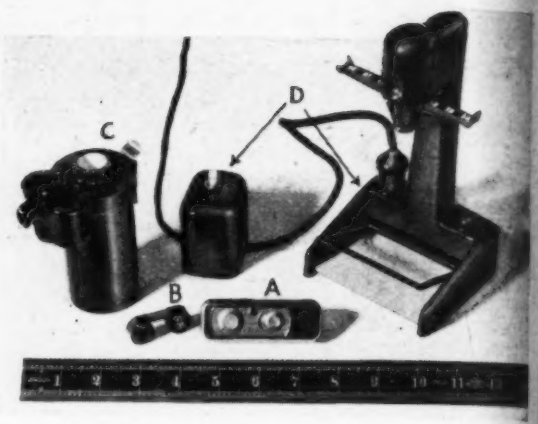
A Really Miniature Camera

V.E.F. Minox Apparatus Measures only 3⅛ in. : Fifty Exposures to the Roll of Film

AS the countryman said when shown a giraffe for the first time "I don't believe it," and that is one's mental reaction when first introduced to the V.E.F. Minox camera. This is a product of the V.E.F. firm of Riga, Latvia, whose other occupations are the manufacture of aircraft and precision instruments.

The Minox is truly a vest-pocket camera. The dimensions are 3⅛ by 1 by ¾in. when closed, the length becoming 3⅞in. when the camera is open. The size of the picture is 11 by 9 mm., shutter speeds from ½ sec. to 1/1,000th of a second are available, and the specification includes an f.3.5 anastigmatic lens focusing from infinity down to as close as 8 inches, a direct vision viewfinder corrected for parallax, a built-in x2 filter and fifty exposures to the roll of film. Opening the camera for use automatically winds on the film, which is a safeguard against double exposure, and at the same time sets the shutter, and, if it has been used for a previous picture, slides the filter from in front of the lens.

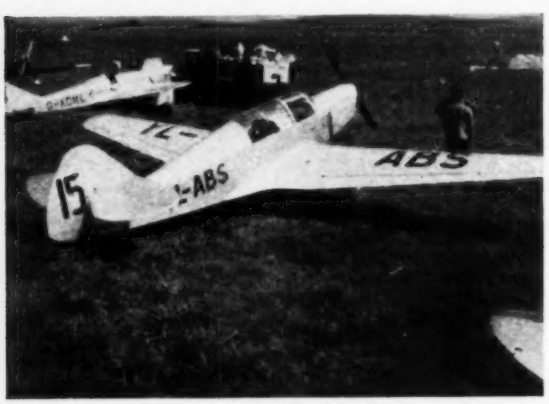
It is difficult to believe that a camera of this size is capable of doing serious work, but the untouched reproduction shown on this page of the V.E.F. J.12 light plane is one of the results taken by *Flight*. One must remember that blemishes enlarge in exactly the same proportion as do other details, and the utmost care must be taken to save the negative film from abrasions and finger marks. This is the most serious drawback as the film is small to handle.



The V.E.F. Minox outfit compared with a ruler: (a) The camera close, (b) Roll film cartridge, (c) Developing tank, (d) Enlarger with transformer and wiring.

Companion apparatus is available for those (spies for instance) who like to do their own developing and printing. A spiral tank holding the enormous quantity of one ounce of solution takes care of the development, fixation and washing of the negative film, and a baby enlarger 18 inches high brings the size of the image up to 3½ by 2½ inches.

Full particulars and prices of the camera and companion apparatus may be had from Minox, Ltd., 29, King William Street, London, E.C.4, the managing director of which is Philip Avery, agent for this country.



An untouched photograph taken by *Flight* with the miniature camera above. It shows the V.E.F. J12 cabin monoplane at Ronaldsway, Isle of Man.

Intava Service

THE words Intava and service are synonymous, but whereas the world-wide service associated with the distribution of Intava aviation fuels, oils and special products is well known, it may not be so generally known that their staff is serving in another sense.

Of the four original members who have built up the Intava organisation in this country three are serving in the flying services. Flt. Lt. Christopher Clarkson, the manager, and his assistant Sq. Ldr. N. M. S. Russell, are in the R.A.F., and Mr. A. J. Green is a Sgt. Plt. in the R.A.F.V.R. Mr. O. F. Maclaren (Flg. Off., R.A.F.O.) is at present serving on the Aviation Petrol Pool and in this capacity he has been granted temporary exemption from service.

The work of Intava, Ltd., continues with a depleted staff under the management of Mr. D. Airey, at Artillery House, Artillery Row, London, S.W.1.

PUBLICATIONS RECEIVED

Gallantry, by Sir Arnold Wilson and Capt. J. H. F. McEwen; 12s. 6d. Oxford University Press, Amen House, Warwick Square, London, E.C.4.

Inspection of Aircraft after Overhaul ("B" Licence), by S. J. Norton; 3s. 6d. 4th edition. Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, London, W.C.2.

Booklet: Cygnet monoplane. General Aircraft Co., Ltd., London Air Park Feltham, Middlesex.

Verslagen en Verhandelingen van het Nationaal Luchtvaartlaboratorium, 1939. Amsterdam, Holland.

A Passenger to Adventure, by Marjorie Shuler; 12s. 6d., D. Appleton-Century Co., 34, Bedford Street, Strand, London, W.C.2.

AERONAUTICAL PATENT SPECIFICATIONS

(*Published November* 16, 1939.)

1937.

16515. SCHEIBER, H., and PETERS LOCK CO., LTD. Trigger mechanisms for machine guns (513,722).

33210. HILLIER, A. (SPERRY GYROSCOPE CO., INC.). Magnetic compasses (513,624).

33974. THORNTON, A. A. (TAYLOR INSTRUMENT COS.). Control systems (513,625).

35379. KRAMOLIN, L. DE. Arrangement for increasing the selectivity of electric amplifying apparatus (513,626).

1938.

1039. WATSON, S. C., PARCELLE, A. J., and ANGUS, W. J. Variable-speed shaft coupling (513,578).

1341. MAGNESIUM ELEKTRON, LTD. (I.G. FARBENINDUSTRIE AKT.-GES.). Magnesium alloys (513,627).

1654. NATIONAL BROACH AND MACHINE CO. Method of finishing surfaces, and machine therefor (513,677).

3285. BENDIX AVIATION CORPORATION. Internal-combustion engine ignition systems (513,629).

4530. OELSNER, W. (trading as OELSNER AND CO., W.). Sound-regulating and sound-insulating wall or ceiling construction (513,580).

5004. MARCONI'S WIRELESS TELEGRAPH CO., LTD., and RAMSAY, J. F. Electrical oscillation generators (513,679).

6594. BRITISH THOMSON-HOUSTON CO., LTD. Electric motors (513,632).

6833. BRITISH THOMSON-HOUSTON CO., LTD., and MAGGS, A. H. Electric motors (513,635).

6892. MARCONI'S WIRELESS TELEGRAPH CO., LTD., and ZEPLER, E. E. Radio and like receivers for continuous waves (513,637).

7676. COOK, J. F. Vehicle spring-suspensions (513,682).

7909. BALMFORD, A. B., and JONES, J. Internal-combustion engines using gaseous fuel (513,587).

8216. BOSCH GES., R. Control systems for electric motors (513,645).

9084. SHEVLIN, J. T. Gyroscopic instruments (513,648).

9487. CONTRAVES AKT.-GES. Method of and means for the observation and location of moving targets, more especially aircraft (513,653).

10066. SHEVLIN, J. T. (SIEMENS APARATE UND MASCHINEN GES.). Devices for releasing bombs from aircraft (513,658).

10289. WESTLAND AIRCRAFT, LTD., and PETTER, W. E. W. Engine mountings for aircraft and other craft or vehicles (513,662).

10417. GETEFO GES. FUR TECHNISCHEN FORTSCHRITT. Spring suspension for aircraft (513,664).

10422. STADIUM, LTD., and SEYMOUR, G. E. Fixing bolt arrangements, more particularly for hinge constructions (513,726).

10573. DE HAVILLAND AIRCRAFT CO., LTD., and THOMAS, F. M. Variable-pitch propellers (513,591).

10627. BENDIX, LTD., and ROBERTS, G. P. Vehicle brakes (513,666).

10810. STEVENS, A H. (PRATT, N. P.). Method of utilising the energy of combustible charges in internal-combustion engines (513,668).

11427. ELECTROACUSTIC GES. Arrangements for transmission and reception of sound waves (513,701).

11491. HASEKE, G. A., and STRUBE, M. (trading as TORFIT-WERKE G. A. HASEKE AND CO.). Material for structural parts, made therefrom (513,705).

11493. AMBI-BUDD PRESSWERK GES. Vehicle Doors (513,786).